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## ABSTRACT

This paper outlines the theoretical foundations of Soviet psychology, analyzes major themes based on these foundations, and identifies relevance of Soviet psychological research for American investigators. Basic social and political factors that influence Soviet research include centralization of all scientific and academic endeavors and orientation of all psychology research toward the ideals of Marx and Engels. Major themes which govern psychological research are: 1) a genetic (developmental) theory which maintains that behavior can only be understood as the history of behavior; 2) a social interaction theory (human nature can be understood by examining human productive activity such as labor); 3) mediation (human psychological systems are mediated by sign systems such as speech and behavior patterns); 4) internalization (transfer of external actions to the plane of reflection); 5) motivation and intent (understood as a link between psychological processing and social action); and 6) goal setting (objectives of various activities at various levels of consciousness). For each of these themes, excerpts from major Soviet research works are presented and analyzed. Implications for western psychology research are related including that western researchers have largely ignored the importance of the regulative functions of speech, historical processes, the relationship of thought to language, and the relationship of cognitive processes to the overall nature of activity. (DE)

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A State of the Art Review of Soviet Research  
in Cognitive Psychology

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## I. Introduction

When American researchers turn to Soviet literature in cognitive psychology, they often experience a great deal of frustration. Part of this frustration is attributable to the fact that crucial publications are not translated or are translated poorly. However, even if good translations of all the appropriate materials were available, American researchers would often be left with many unanswered questions. Sometimes these questions would be about methods used in the experimental design or data analysis, but the most important questions would be about the theoretical foundations and assumptions which guide Soviet research. This is manifested by the fact that after reading a Soviet article on cognitive psychology, American investigators often raise questions not so much about what was done or how it was done, but why it was done.

This reflects a fundamental problem we have in understanding Soviet research - a problem that can be traced to a lack of understanding of the philosophical foundations which guide hypothesis generation and empirical inquiry in the USSR. If American investigators do not make an effort to understand these foundations, they will be quite limited in what they can expect to glean from the literature in cognitive psychology. With this in mind, the present review has two basic goals. First, it will attempt to provide an outline of the theoretical foundations that guide much of the current research in Soviet psychology. This outline will be primarily concerned with identifying a set of major themes in these theoretical underpinnings. In connection with our analysis of these themes, we will survey various aspects of the literature in Soviet cognitive psychology. The second goal will be to identify ways in which research motivated by one or more of these themes is relevant to American investigators.

## II. Social and Political Factors that Influence Soviet Research in Cognitive Psychology.

Before beginning our review, we should point out a few important facts about the political and economic factors that govern the way psychological research is carried out in the USSR. Our survey of these factors will by no means be exhaustive. For such analyses one should consult authors such as Graham (1974) or Jorvasky (1961). Unlike these more comprehensive accounts, our review will be limited to those factors which have the greatest influence on the present state of cognitive psychology in the USSR.

First, as is the case for all scientific and academic endeavors in the Soviet Union, research in psychology is much more highly centralized than it is in the U.S. This centralization exists for at least two reasons. The first of these is that political and economic centralization is a pervasive fact about all aspects of Soviet life. Most of us are aware of the fact that this is true of the economy, but it also is an important aspect of science. For example, all universities in the USSR are certified by, and thus answerable to, a central organization in the Soviet government. Also, Soviet research institutes are controlled by one or another central governmental organization. For example, the Institute of Defectology and the Institute of General and Pedagogical Psychology are member institutes of the Academy of Pedagogical Sciences. Recently, another Institute of Psychology has been founded by the USSR Academy of Sciences. In all cases, these institutes are a part of a larger, vertically-organized governmental agency which is centrally controlled. These facts about governmental organization do not mean that all researchers in psychology are of one mind on psychological issues. The lively debates that go on in Soviet psychology quickly dispel such an impression. However, these facts of centralization undoubtedly

promote agreement on many key issues.

The second major political fact about the way that Soviet research in psychology is organized is that the work of Marx and Engels provide the theoretical framework. As Graham (1974) has pointed out, there is some disagreement among western observers of science in the USSR about why Soviets cite Marx and Engels in their writings. Some observers argue that such citations merely meet a political requirement for getting an article or volume published, whereas others argue that it reflects a serious commitment to Marxist philosophy. It seems to us that the latter position is closer to the truth, but not necessarily because each modern-day psychologist has surveyed a variety of philosophical positions and chosen Marxism. Rather, the reasons for accepting a Marxist position can be traced to the fact that the founders of Soviet psychology were serious Marxists. Although the approach we will emphasize has not always been openly espoused during the history of Soviet psychology, the basic ideas included in it have served as the main foundations for the theoretical and empirical research conducted during the past quarter century. Thus, our point is that the issue here is not so much one of whether every Soviet psychologist has made a conscious decision to base his/her research on Marx's ideas. Rather, the issue is one of the theoretical milieu which has emerged out of historical forces - something that plays a pervasive role in any scientific community. The feature which distinguishes this theoretical milieu from that which guide western psychology is that it grew out of the writings of Marx, Engels and Lenin.

We should point out that the acceptance of Marxist theoretical foundations is not unique to psychology in the USSR. As authors such as Graham (1974) have pointed out, all areas of Soviet scientific inquiry are guided to some extent by Marx's ideas. Of course his theory can be used to varying degrees

and in different ways for various disciplines. In social sciences such as sociology, economics and psychology this influence has been very powerful.

Thus we see that two factors = governmental organization and a Marxist theoretical orientation = have tended to unify Soviet psychology to a greater degree than can be found in the west. Many Soviet researchers view this unification as an advantage because it allows them to focus enough resources and thought on a problem long enough to arrive at some conclusion. They often criticize western psychology for being unable to do this. Whether western readers view this unification as beneficial or not, they should welcome it for at least one reason - it simplifies our task of examining Soviet cognitive psychology. We should re-emphasize that we are not claiming that no active debate goes on among Soviet researchers. However, the debate that does take place tends to occur within certain theoretical boundaries, and this alone allows us to set certain limits as we approach our task.

In our analysis of Soviet cognitive psychology we will be concerned primarily with the school founded by Lev Semenovitch Vygotsky (1896 - 1934). We have elected to focus on a single approach for several reasons. Primary among these is the fact that Vygotsky and his followers have played a dominant role in the formulation of cognitive psychology as it presently exists in the USSR. Also, for the reader seeking an overview of Soviet psychology we thought it more appropriate to explicate in some depth a single approach that addresses many of the issues common to most Soviet schools rather than to examine the differences among these schools.

This means that relatively little attention will be given to other figures in Soviet psychology such as D.N. Uznadze, the founder of a Georgian school concerned with the psychology of set. We should note, however, that in the case of another figure in Soviet psychology, S.L. Rubinshtein (1889 - 1960), we will

attempt to identify some of the places where he has made a major theoretical contribution and include his ideas in our discussion. His analysis of consciousness has been very important in Soviet psychology, and his followers are playing an increasingly important role in empirical and theoretical research in the USSR.

Vygotsky's main goal was to reformulate psychology on Marxist foundations. He viewed the discipline as being incapable of dealing with many of its most important issues unless it underwent a fundamental theoretical reconstruction based on Marxism. His ideas and the ideas of his followers have undergone many revisions over the past several decades. The fundamental starting point for Vygotsky's approach (especially as it has been extended by his followers), as well as for Rubinshtein, is the notion of activity (*deyatelnost'*), a term that has a specific technical meaning in Soviet psychology. It is the fundamental category from which other psychological concepts such as consciousness, internalization and mediation are derived. Its importance is obvious as soon as one examines the ways that the major figures in Soviet psychology have laid their theoretical foundations. For example, in his review of Rubinshtein's basic theoretical tenets, Payne asserts that:

Rubinshtein therefore seems to consider psychology as the general science of human activity. Where other sciences study human activity, either in terms of the tasks it fulfills or of the products of that activity, psychology is concerned with the general structure of human activity and the concrete conditions under which it is produced. (1968, p. 125)

As we will see, the major contemporary theoretician of the Vygotskian school, A.N. Leont'ev, has taken a similar position on activity. Its role is so important in Leont'ev's approach that it is known as the "theory of activity."

The crucial role of the notion of activity in Soviet psychology can be traced directly to comments Marx made in his critique of materialistic

theories that existed at the time he was writing. The specific quote that serves as the starting point for many psychological analyses is the following one from Marx's Theses on Feuerbach:

The chief defect of all hitherto existing materialism (that of Feuerbach included) is that the thing, reality, sensuousness, is concerned only in the form of the object or of contemplation, but not as sensuous human activity, practice, not subjectively. Hence, in contradistinction to materialism, the active side was developed abstractly by idealism - which, of course, does not know real, sensuous activity as such. Feuerbach wants sensuous objects, really distinct from thought objects, but he does not conceive human activity itself as objective activity. (Marx and Engels, 1968, p. 659)

Leont'ev has argued that these ideas resulted in a "profound revolution... in the theory of cognition..." because they led psychologists to understand that "...practice is the process in the course of whose development cognitive problems arise, human perceptions and thoughts originate and develop..." (1978, p. 12) He has argued that the notions contained in this quotation played a major role in the formulation of Vygotsky's and Rubinshtein's approach to psychology. Rather than accepting concepts such as memory, problem solving and perception as the basic phenomena of psychological investigation, Leont'ev has argued that largely due to the influence of figures such as Vygotsky and Rubinshtein, Soviet psychology views human activity as the basic category from which all other psychological phenomena derive.

The analysis of activity...comprises the decisive point and principle method of scientific cognition of psychic reflection, consciousness. In the study of the forms of social consciousness it is the analysis of social life, characteristic means of production, and systems of social relationships; in the study of the individual psyche it is the analysis of the activity of individuals in given social conditions and concrete circumstances that are the lot of each of them. (1978, p. 14)

Given this position, Soviet psychologists have emphasized the need to study the ways that humans actively interact with one other and with the physical world around them. They have systematically avoided

viewing the human organism as a passive receptor of information or stimuli but all the while have maintained the existence of a preexisting, external world - an ontological position of obvious importance to a materialistic approach.

### iii. Central Themes in the Theory of Activity.

Given the central role of the notion of activity in Soviet psychology, any attempt to understand ongoing research efforts in the USSR must be based on its analysis. In this section we will attempt to deal with this issue by outlining six major themes which have come to play a central role in the theory of activity. These six themes do not cover everything in this approach, and some of them overlap with one another. Thus, our list is not ideal in all respects. But given the complexity of the issues and the diversity of opinions involved in the various schools, it seems to provide a good starting point for our analysis of Soviet cognitive psychology. It is only when these themes are interrelated that the theoretical framework of Soviet cognitive psychology comes into focus. Some of the themes are more central to the theory of activity than others, and different themes have different historical origins. However, they all can be traced, more or less directly, back to the ideas of Marx and Engels, and they all can be found explicitly or implicitly in Vygotsky's writings. The six themes we will cover are: a) genetic explanation as the primary method of analysis; b) the importance of social interaction in the origin and development of cognitive processing; c) the role of mediation (especially with sign systems) in social and cognitive processes; d) the importance of the notion of internalization; e) the importance of the functional structure of activity; and f) the use of goal-directedness as a notion in the analysis of cognition.

### III.A. Genetic Explanation

The first major theme in the theory of activity is that of developmental or genetic explanation. Whereas the other five themes we will outline are concerned with the content or structure of activity, genetic explanation is a fundamental issue of epistemological method.<sup>1</sup> B.F. Lomov, Director of the Institute of Psychology of the USSR Academy of Sciences has noted the importance of genetic explanation as follows.

To understand any mental phenomenon one must view it in a process of development; indeed, that is the only way it can be understood. Development here, of course, is not seen as some monotonous process of mere quantitative changes, but as a process in the course of which contradictions emerge and are resolved and qualitative transformation takes place in the system of mental phenomena. (1978-79, pp. 73-74)

The issue of genetic explanation as a method can perhaps best be encapsulated in P.P. Blonsky's (1921) assertion that "Behavior can be understood only as the history of behavior." Drawing on Blonsky's ideas as well as those of Marx and Engels, Vygotsky attempted to devise a serious genetic theory. We use the word "serious" here to indicate that Vygotsky was not proposing a genetic approach that simply involved a series of quantitative increments. Rather, he was interested in major qualitative transformations as well. This concern is a result of his acceptance of dialectical materialism. Specifically, its origins can probably be traced to Engels' formulation of the dialectical law of the transformation of quantity into quality.

Vygotsky (e.g., 1972, in preparation a) often wrote about the notion of development and stressed that when analyzing it we should look for the sudden, sharp qualitative changes as well as the smooth progression of quantitative increments.

Thus, the overall picture is one of critical periods alternating with stable ones. The critical periods are turning points in development, once again confirming the notion that the development of the child is a dialectical process in which the transition from one step to another is accomplished not by an evolutionary, but by a revolutionary path. (1972)

In his analysis of the notion of development in Soviet psychology Kussman (1976) has also pointed out the important distinction between "evolution" and "revolution." In the west, a similar concern with the very notion of development can most readily be seen in the writings of Werner and his colleagues (e.g., Werner 1957, 1961; Werner and Kaplan 1956, 1963; Kaplan 1966, 1967).

The method of genetic explanation has prompted Soviet investigators to examine psychological phenomena by tracing them throughout the complete course of their development. For example, Vygotsky stressed that

...the aim of psychological analysis and its essential factors are as follows: 1) process analysis as opposed to object analysis; 2) analysis that reveals the real, causal or dynamic relations as opposed to enumeration of a process's outer features, that is, explanatory, not descriptive analysis; and 3) developmental analysis that returns to the source and reconstructs all the points in the development of a given structure. (1978, p. 65)

We should point out that genetic explanation is not only concerned with what we normally consider to be history. It is used by Soviets in a variety of "genetic arenas." These include phylogenesis, human history, ontogenesis and microgenesis. A few words about each of these will illustrate how their use is motivated by a common concern.

Phylogenetic comparisons often appear in the writings of Soviet cognitive psychologists. Vygotsky and his followers were especially prone to use them. For example, in his analyses of how tools and sign systems mediate human cognitive processes, Vygotsky relied heavily on Koehler's studies of tool-using behavior in apes. Engels' speculations in this area had an important influence on his thinking as is evidenced by the fact that when developing his notion of the "natural line of development" in humans, Vygotsky pointed out that in Dialectics of Nature (1940) Engels proposed that apes and humans have certain types of intellectual activity in common. Vygotsky (e.g., 1962,

in progress a) often used phylogenetic comparison in developing his point that humans' use of tools and sign systems leads to a dialectical negation of a genetically prior or "natural" line of development and that their subsequent development goes well beyond that of apes.

A.N. Leont'ev (1972) has also reviewed the phylogenetic aspects of the development of mind. Like Vygotsky, he stresses that as is the case with any form of development, phylogenesis does not simply consist of a series of quantitative increments. In particular, with the emergence of societies, he argues that the developmental processes which give rise to human mental functions undergo a qualitative change.

The notion is still widespread that the phylogenesis of humans is an uninterrupted process guided by the laws of biological evolution. At first glance, the description of fossilized human remains produces a quite convincing picture of progressive morphological changes which continue today and will continue in the future, maybe with the prospect of the appearance of a new human species - some kind of *Hominum futurorum*.

Such a position is connected with the conviction that human evolution, as determined by biological laws, applies at all levels of phylogenesis, including the development that occurs after societies have emerged. It assumes that we will still see the process of biological selection and that this process will result in further human adaptation to societal demands.

However, modern paleoanthropology rejects this notion of anthropogenesis as well as the crude biological conclusions which inevitably follow. The most important contribution to the scientific theory of anthropogenesis is the doctrine that human phylogenesis results in a series of fundamentally different stages, each superceding the other and that different laws operate at each of these stages. (1972, pp. 357 - 358)

While interested in how the problem of phylogenesis made human thinking possible, Leont'ev has specifically ruled out an account which operates solely within this phylogenetic arena. Thus after outlining some of the phylogenetic change that lead up to the appearance of human beings, Leont'ev turns to the major qualitative change of interest to Soviet psychologists.

The qualitative change which distinguishes these stages from the preceding preparatory stage consists of the fact that with *pithecanthropus* there emerged the manufacture of tools and primitive co-operative

activity with the help of tools, i.e., rudimentary forms of labor and social interaction emerge. This produces a fundamental change in the course of development itself. (underlining mine - JVW) (1972, pp. 358 - 359)

This quote reflects the fact that Vygotsky and his followers stressed the difference between human social history and phylogenesis.

Human social history has been a much more important genetic arena than phylogenesis for Soviet cognitive psychology. It is so central for Vygotsky, that in the USSR his theory is referred to as the "cultural-historical" or "socio-historical" approach. (cf. Smirnov, 1975; also see Luria, 1971). The concern with historical processes is a direct outgrowth of Marx and Engels' theory of historical materialism and is manifested in Soviet cognitive psychology in a variety of ways. For example, Vygotsky and his students such as Luria and A.N. Leont'ev have traditionally been concerned with the history of writing systems and their function in human cognition. In trying to understand how literacy changes the course of ontogenesis, they often draw comparisons with its development in social history. A manifestation of this interest in the historical arena of genetic explanation can be found in the research Luria (1975) conducted in Soviet Central Asia during the thirties. This is understood as cross-cultural research in the west, but in many respects it would be more appropriate to consider it as "cross-historical" research. This is so because Luria used his research as a way to examine the influence of new cultural institutions on individuals' cognitive processing. Soviet Central Asia served as an excellent cross-historical laboratory at the time Luria did his research because the population there was in the midst of collectivization, a process in which they were rapidly introduced to practices and skills (e.g., literacy) from societies of a different era as viewed from the perspective of historical materialism.

The third genetic arena in which Soviet cognitive psychologists operate is ontogenesis. In the west, developmental psychology is often equated with the study of ontogenesis, but as we have seen already this is just one of the genetic arenas which interest Soviet cognitive psychologists. As Cole and Scribner (1978) point out, "...when Vygotsky speaks of his approach as 'developmental,' this is not to be confused with a theory of child development. The developmental method, in Vygotsky's view, is the central method of psychological science." (p. 7)

While it is true that ontogenesis is not the only developmental arena utilized by the Soviet cognitive psychologist, it is probably the most important one. Most of the Soviet investigators who are best known in the west (e.g., Vygotsky, A.N. Leont'ev, Luria, El'konin, Zaporozhets, and V.P. Zinchenko) have used ontogenetic data extensively. However, many Soviet investigators who deal with ontogenetic issues would not consider themselves to be developmental or child psychologists in the sense of this term in the west. They view the ontogenetic arena as only one of several ways that they can produce genetic explanations of psychological phenomena. The heavy emphasis on ontogenesis is also partly attributable to the fact that in addition to theoretical considerations Soviet investigators are strongly influenced by the need to help solve the practical problems confronting the Soviet Union, and one of the major practical concerns has been education.

The fourth genetic arena used in Soviet cognitive psychology is microgenesis. As Zinchenko (1978) points out, the term "microgenesis" (mikroenez) has been used in psychology for several decades now. It was introduced into the technical vocabulary of English and Russian as a translation of the German term "Aktualgenese" used by Werner. Although the term "microgenesis" is seldom used by Soviets, they often utilize this form of development in

conducting their research. Actually, there are two types of microgenetic progression that have been examined in Soviet research. These two types have also been identified and used in the west, most notably by Werner (1961) and his colleagues (e.g., Kaplan, 1967). The first type of microgenesis is a progression that occurs over a short period such as a single experimental or teaching session. It involves observations of subject's repeated trials in a task setting. Thus, one could think of it as a very short longitudinal study. In a paper on methods in psychology, Vygotsky has argued that this type of microgenetic analysis could be very useful. He pointed out that learning and experimental studies often fail to utilize what may be the most interesting data they generate when trying to train a subject to criterion before beginning the "real observations."

Uniformity was sought, so that it was never possible to grasp the process in flight; instead, researchers routinely discarded the critical time when a reaction appears and when its functional links are established and adjusted. Such practices lead us to characterize the responses as "fossilized." They reflect the fact that these psychologists were not interested in complex reactions as a process of development. (1978, p. 68)

This first type of microgenetic change has been one of the interests of V.P. Zinchenko and his colleagues (e.g., Kochurova, Visyagina, Gordeeva, and Zinchenko, in preparation) in their studies the development of a subject's eye-hand co-ordination over many repeated trials during a single training session.

The second type of microgenesis is concerned with the unfolding of individual percepts or concepts, usually over the course of milliseconds. As in the case of the first type of microgenesis, this second notion probably is derived from Werner's writings in which he distinguished between two types of "genetic experiment" along these very lines. V.P. Zinchenko and

his colleagues (e.g., Kochurova, Visagina, Gordeeva and Zinchenko, in preparation; Zinchenko and Strelkov, 1974) have been conducting extensive research in connection with this second type of microgenesis. This research is carried out in their microanalysis and microstructural analysis of data from experiments involving eye-hand co-ordination. Another instance of how this second type of microgenesis is used in Soviet psychology can be found in the work of Luria (1966, 1970, 1976) and his colleagues (e.g., Akhutina, 1978) in the area of speech production. These investigations do not abstract one or another phase of speech production and study it alone. Rather, they proceed from the assumption that any particular phase in speech production can only be understood by analyzing how it fits into the entire sequence of steps in the process. Taken out of its genetic context, the behavior or mental process cannot be fully understood.

As Wertsch and Stone (1978) have pointed out, cognitive psychologists in the west have seldom examined mental or behavioral phenomena from a microgenetic perspective (but see Flavell and Draguns, 1957). However, simply adding one or more techniques for investigating cognitive phenomena is not the point as far as Soviet investigators are concerned. The real point for them is that it is possible to explain phenomena in cognitive psychology only by examining its development. In this sense, virtually all Soviet psychologists are developmental psychologists.<sup>2</sup> This approach means that in order to understand a phenomenon at any stage of development (no matter what the arena), one must understand its previous state(s) and the process of dialectical negation that will lead to future states. The theme of genetic explanation in Soviet psychology will become clearer as we analyze how it interacts with other themes in the theory of activity.

### III.B. The Social Interactional Origins of Human Cognitive Processes

The second major theme in the theory of activity is that the origins of human cognitive functioning are to be found in social interaction. Here again, this theme can be traced to the writings of Marx and Engels. The thrust of Marx's materialist conception of history was that in order to understanding human nature and history we must understand human productive activity, or labor. This argues for the necessity of understanding the processes of social co-ordination which are inherent in labor activity.

Soviet psychologists have incorporated these ideas into their approach by arguing that individuals' cognitive capacities, personality, etc. emerge out of social interaction. Social interaction is thus viewed as analytically prior to individual functioning. For example, N.K. Kornilov, one of the first Soviet psychologists to propose a Marxist psychology, argued that, "We must proceed not from individual to social psychology, but conversely...only on the basis of social factors will we be able to understand the problem that occupies empirical research - the psychology of the individual." (As quoted by Leont'ev 1972, p. 349)

Vygotsky's approach was similar to Kornilov's in this regard (though not in many others). In his account of Vygotsky's foundation of a Marxist psychology, Luria (1977) argued that Vygotsky's basic premise was that:

In order to explain the highly complex form of the conscious life of humans one has to go beyond the human organism. One has to seek sources of this conscious activity and "categorical" behavior not in the recesses of the human brain or in the depths of the spirit, but in the external conditions of life, and, in the first place, in the external condition of social life, in the social and historical forms of human existence. (1977, p. 18)

This basic postulate of the social origins of human cognition was developed in several ways by Vygotsky and his students. It appears in two related, but analytically distinct ways. First, within the genetic arena of human social

history, these theorists have argued that presently existing human activities and tools can only be understood by examining their socio-historical origins and development. For example, A.N. Leont'ev has written that:

In the course of its history, mankind has developed great mental powers and abilities. Thousands of years of social history have produced infinitely more than millions of years of biological evolution. These achievements in human abilities and traits have been accumulated by being transferred from one generation to the next. In order to do this, these achievements had to be somehow consolidated. But we have already seen that during the era dominated by social laws, they have not been consolidated in morphological characteristics or in the form of fixed genetic changes. They have been consolidated in a special, external ("exoteric") form. (1972, pp. 361 - 362)

Leont'ev went on to argue that these cultural achievements are the tools and sign systems, the forms of human activity (especially labor), and the products of this activity. The child's task in ontogenesis is to master these socially defined activities and tools. It is important to note that this socially oriented approach is not to be interpreted as dealing with some special form of "social cognition" which is separate from logical cognition about objects in the physical world. One of Vygotsky's students, D.B. El'konin (1972) has made this quite clear.

The system "child-thing" is in reality the system "child-social object." Socially evolved modes of action with these are not given immediately as physical properties of the objects. We do not find inscribed on the object where and how it originated, how we may operate with it, how we can reproduce it. Therefore, that object cannot be mastered through adaptation, through a mere "accommodation" to its physical properties. This must take place internally; the child must go through a special process of learning the social modes of action with objects. In this process the physical properties of an object serve merely as referents for the child's orientation in his actions with that object. (1972, pp. 237 - 238)

An obvious implication of this approach is that children of various cultures and historical epochs will be confronted with different activities and hence, forms of intellectual functioning.

This is an important point on which the Soviet approach differs from Piaget's. Piaget (at least in his later work) has been concerned with how

children develop universal logicomathematical laws of operative intelligence, primarily on the basis of abstracting certain aspects of one's actions with physical objects. According to him, children must discover these laws by interacting with the physical world.<sup>3</sup> Unlike Soviet authors, he does not begin his analysis from the position that objects are socially defined, and he is not particularly concerned with socially defined activities and their role in ontogenesis. A few western authors have criticized Piaget on these grounds. For example, Buck-Morss (1975) has argued that Piagetian formal operations may reflect social and economic forces.

The second way in which the Soviet position argues that the origins of cognition are to be found in the social world is concerned with the ontogenetic processes involved in socialization. The basic argument in this case is that in order to be introduced into the world of human activity, one must participate in it, and the only way to participate in it initially is to engage in social interaction with more experienced members of the culture. Here again, Vygotsky was instrumental in introducing this point into Soviet psychology. Given his genetic method of explanation and his general Marxist orientation, it is not difficult to understand why he arrived at the conclusion that social interaction gives rise to individual cognitive functioning. For example, in a paper he wrote between 1930 and 1931, he argued that:

Formerly, psychologists tried to derive social behavior from individual behavior. They investigated individual reactions which were found in the laboratory and then they studied them in the collective. They studied how the individual's responses change in the collective setting. Posing the problem in such a way is of course quite legitimate, but genetically speaking, it deals with the second level in behavioral development. The first problem is to show how the individual reaction emerges from the forms of collective life. In distinction from Piaget we propose that development does not proceed toward socialization but toward the conversion of social relations into mental functions.<sup>4</sup> (In preparation, a, p. 21)

In this quotation, one can begin to see how the themes in the theory of

activity are woven together. Thus, Vygotsky argues that one could study individual functioning without taking its social origins into account that such an approach would be greatly weakened by its failure to utilize the method of genetic explanation.

One of the most important contributions Vygotsky and his colleagues have made to the argument that individual cognition emerges out of social interaction in ontogenesis is the notion that one and the same activity can be carried out on the social plane or on the individual plane. That is, their claim has not been simply that social interaction somehow results in individual cognitive functioning. Rather, they have argued that the very processes, relationships, etc. that are involved in social interaction are eventually taken over and internalized by the child to form individual cognitive processes. This progression is a cornerstone of what Vygotsky termed the "general genetic law of cultural development." He described the processes involved in this law as follows:

...any function in the child's cultural development appears twice, or on two planes. First, it appears on the social plane and then on the psychological plane. First it appears between people as an interpsychological category and then within the child as an intrapsychological category. This is equally true with regard to voluntary attention, to logical memory, to the formation of concepts, and to the development of volition. (In preparation a, p. 19)

El'konin has argued for a similar ontogenetic progression in connection with his extensive analysis of the development of speech. He argues that activities which will subsequently be carried out independently by the child are first carried out with adults. For example, in his analysis of preschool speech he argues that:

The activity of a child of this [preschool] age usually is accomplished either together with adults or with their help; therefore, his socializing may be characterized as situational. This imparts on speech a special form - that of situational speech having a dialogic character in most cases...

The dialogic form of speech in early childhood may be viewed as

evidence and also expression of a child's insufficient independence or lack of separation of his activities from those of adults. (1971, p. 111)

The claim that the origins of individuals' cognitive functioning must be sought in social interaction has had many practical implications for Soviet psychology. One of the best examples of this can be seen in Vygotsky's (1978) notion of the "zone of proximal development." Vygotsky devised this notion in order to deal with what he viewed as a serious weakness in intelligence testing procedures. His criticism was based on the fact that these procedures have usually been limited to examining how the individual functions independently and have disregarded the social origins of cognitive abilities. By failing to take these social foundations into account, he argued that we have ruled out the possibility of discovering what new abilities are emerging at the time of testing. By focusing on the way that cognitive abilities emerge out of social interaction, intelligence testing procedures could not only tell us what children have already developed but also "where they are going." As A.N. Leont'ev pointed out in a discussion with Brofenbrenner (1977) this is an important point for the Soviets.

It seems to me that American researchers are constantly seeking to discover how the child came to be what he is; we in the U.S.S.R. are striving to discover not how the child came to be what he is, but how he can become what he not yet is. (p. 528)

Vygotsky's notion of the zone of proximal development deals with this issue by arguing that in order to understand how the child can become "what he not yet is," one must examine the ways that the child participates in social interaction with more experienced members of his/her culture. Vygotsky's zone of proximal development is the difference between two levels of development.

The first can be called the actual developmental level, that is, the level of development of a child's mental functions that has been established as a result of certain already completed developmental

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cycles... In studies of children's mental development it is generally assumed that only those things children can do on their own are indicative of mental abilities... On the other hand, if we offer leading questions or show how the problem is to be solved and the child then solves it, or if the teacher initiates the solution and the child completes it or solves it in collaboration with other children - in short, if a child barely misses an independent solution of the problem - the solution is not regarded as indicative of his mental development... [The zone of proximal development] is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers. (1978, pp. 85-86)

Thus Vygotsky and his followers even went so far as to reformulate the notion and measurement of intelligence in view of the role of social interaction in cognitive development.

A second example of how Soviet investigators stress the role of social interaction in the formation of cognitive abilities can be seen in the writings of Meshcheryakov (1974). He applied this basic postulate of Soviet psychology to pedagogical and research problems with deaf-blind children. As director of an experimental school for such children, he was instrumental in devising various methods based on the role of social interaction in cognitive development. His approach was based on the notion that basic social contact must be established between adults and children before the latter can begin to develop an understanding of the physical world. Thus the child is viewed much less as an independent inventor and discoverer than is the case in a Piagetian approach.

Up to this point in our account of this theme we have focused on how Soviets view social interaction as the origin of individuals' cognitive capacities. Before leaving this theme, however, we should point out that recently there have been some very interesting Soviet studies which have not approached social interaction solely from the perspective of its role in the transition from interpsychological to intrapsychological functioning.

These studies have instead been concerned with the fact that in certain cases functioning at the interpsychological plane will continue to be more effective even in adulthood.

In one of these studies, Lomov (1978) asked adult subjects to solve various problems (searching for a hidden object, drawing a map of a familiar location in a city, recalling a poem) individually and in pairs. He found that in these tasks, the end product was usually superior in the case of joint problem solving. For example, in recalling the beginning of the first chapter of Pushkin's poem Eugene Onegin he found that the joint recall effort yielded more material than the intersection of the material recalled by the subjects when acting alone. Also, the subjects' accuracy and level of confidence in their recall was higher under conditions of joint recall. Lomov went on to examine the processes of social interaction that allowed this superior performance when operating on the interpsychological plane. On the basis of his analysis of protocols of the interaction, he concluded that:

The chief functions of communication (in our case) consists of an exchange of the results of cognitive activity of each individual; mutual regulation and correction of the operations carried out by each of them, and the formation, on this basis, of a joint group, an aggregate subject of activity. (1978, p. 19)

He also outlined some of the mechanisms and stages in the communication that permitted these functions to be carried out.

In another study, Kol'tsova (1978) studied the communication processes involved in instructional settings with students in the ninth grade. Specifically, her concern was with how students formed concepts used in social studies when they study these concepts alone as opposed to studying them in collaboration with two to four peers. Kol'stova found that concept formation was generally superior among student who had participated in the condition

which had allowed collaboration and discussion with peers. Furthermore, she found that the weak and average students benefitted most from interaction with others.

### III.C. The Role of Mediation in Social and Cognitive Processes

The third major theme in the theory of activity is that historically developed tools and sign systems (especially the latter) play an important role in mediating human psychological processes. As we develop this theme further, it will become apparent that it is closely related to the theme we just outlined - the social interactional origins of cognition - and that the separation of the two is to some degree artificial. Hence, much of what we will have to say about this third theme will be an extension of the one we just considered.

The important role given to the study of sign systems (i.e., semiotics) in Soviet psychology is primarily attributable to the influence of Vygotsky. While his main concern was psychology, he had a long and abiding interest in semiotics. One can begin to appreciate this interest when one considers the fact that in his personal notebooks he wrote that the analysis of signs (semicheskii analiz) is "the only adequate method for investigating human consciousness." (1977, p. 94) As is the case with other themes in the theory of activity, one can identify the influence Marx and Engels had on this theme. Vygotsky extended their analysis of the mediational role of tools to sign systems. The possibility of such an extension can be seen when we consider the following quote from Marx.

An instrument of labour is a thing or complex of things, which the labourer interposes between himself and the subject of his labour, which serves as the conductor of his activity... The use and fabrication of instruments of labour, although existing in the germ among certain species of animals, is specifically characteristic of the human labour-process, and Franklin therefore defines man as a tool-making animal. (1960, pp. 199-200)

Engels also stressed the mediational role of tools in the labor process.

When after thousands of years of struggle the differentiation of hand from foot, and erect gait, were finally established, man became distinct from the monkey and the basis was laid for the development of the brain that has since made the gulf between man and monkey an unbridgeable one. The specialization of the hand - this implies the tool, and the tool implies specific human activity, the transforming reaction of man on nature, production. (1940, p. 17)

There is a great deal of evidence that Vygotsky was heavily involved in debates in Soviet semiotics during the twenties and thirties. For example, Ivanov (1974) has argued that several of Vygotsky's ideas about the role of speech in mediating social and cognitive processes were probably developed on the basis of Bakhtin's writings. Elsewhere, Ivanov (1971) has pointed out that Vygotsky participated in a series of seminars on semiotics and linguistics in the twenties and thirties. The list of other participants in these seminars included Vygotsky's student Luria, the linguist Marr, and the semiotician and cinematographer Eisenshtein. Eisenshtein's interactions with Vygotsky seems to have been particularly important. This is evidenced by the parallels between Eisenshtein's notion of representation (izobrazhenie) and Vygotsky's notion of sense (smysl).

We should take special note of the fact that when Vygotsky was developing the theme of how human psychological processes are mediated by sign systems, he was concerned with semiotics rather than the narrower discipline of linguistics. Of course Vygotsky and his followers recognized the importance of language, as opposed to other sign systems. Indeed, they often stated that language was the most important sign system used to mediate human social and cognitive processes. However, they were also interested in other sign systems such as nonverbal pointing, and when dealing with human language they have tended to be primarily concerned with functional analyses - a hallmark of semiotic approaches. For example, in his analysis

of how adults regulate children's attentional processes on the interpsychological plane of functioning, Vygotsky was primarily concerned with a functional rather than a structural analysis of linguistic and nonlinguistic signs. He argued that speech functions first to indicate or point out objects to children and only later takes on the added function of helping them abstract specific properties of these objects. In developing this point he proposed that his analysis of the ontogenesis of speech functions can reveal important facts about the general nature of sign systems.

Our initial words have indicatory meaning for the child. In addition, it seems to us that we have identified the original function of speech, which has not been appreciated by other researchers. The original function of speech is not that the word has meaning for the child, it is not that a corresponding new connection is created with the help of the word. Rather, the original word is an indicator. The word as an indicator is the primary function in the development of speech from which all others may be derived. (In preparation b, p. 33)

The central argument in connection with how sign systems mediate human psychological functions is concerned with the issue of control or regulation. Simply stated, the argument (in the ontogenetic arena) is that children first participate in social interaction which is regulated and organized by sign systems and then use these same sign systems in self-regulation. This semiotic functioning is then eventually internalized. According to this Vygotskian semiotic perspective sign systems play an important role in the transition from the interpsychological to the intrapsychological plane of functioning. Ivanov (1977) has recently summarized this point as follows:

As the outstanding Soviet psychologist L.S. Vygotsky observed in the 1930's, signs are a means of controlling human behavior. Man cannot govern his own behavior directly and creates signs in order to control it indirectly. The history of culture can be described to a great extent as the transmission in time of sign systems serving to control behavior. Semiotic systems for the programmed control of human behavior are elaborated due to the internalization of external signs, a process that can be partly compared to the emergence of internal speech. Investigation of children's speech make it possible to ascertain that speech arises initially only as a means of communication and a way for adults to control the infant's behavior. (1977, pp. 29-30)

From this quote, one can begin to understand how the mediational theme and the social interaction theme are inextricably linked for the Soviets. Sign systems are viewed as first emerging on the social or interpsychological plane and only then begin to function on the individual or intrapsychological plane. When we consider these two themes in light of the first theme that we outlined (that of genetic explanation), we can gain further insight into the overall theoretical coherence of the approach to cognitive psychology used by the Soviets. When examining the mediational role played by sign systems on the intrapsychological plane, they would argue that a proper explanation must be based on an analysis of the origins and developmental path of this function. When one examines the way Vygotsky developed his arguments about the cultural or social line of development, it becomes apparent that this was a very important point.

The sign always originally is a means used for social purposes, a means of influencing others. Only then does it become a means of influencing oneself... If it is correct that the sign initially is a means of social interaction and only then becomes a means of behavior for the individual, it is quite clear that cultural development is based on the use of signs and their inclusion in a general system of behavior which initially was external and social. In general, we could say that the relations between higher mental functions at some earlier time were actual relations among people. I will relate to myself as people relate to me. Just as verbal thought is the transferal of speech to an internal level, and just as reflection is the transferal of argumentation to an internal level, the mental function of the word, as Janet demonstrated, cannot be explained other than through a system broader than individual humans. The word's first function is the social function, and if we want to trace how the word functions in the behavior of an individual we must consider how it functioned formerly in social behavior. (In preparation a, pp. 13-14)

Vygotsky's most important contribution in connection with how sign systems mediate human psychological processes was concerned with speech. Vygotsky (1962) argued that during the early years of a child's life the primary function of speech is communication and social contact. Then, sometime around the third year of life, children's speech begins to serve an

additional, self-regulative function. He argued that children do not initially differentiate this regulative function of speech from its communicative function, and therefore produce overt, self-regulative utterances in social interaction contexts. These utterances comprise "egocentric speech" - a term he borrowed from Piaget. Then, roughly between the ages of three and seven, children come to distinguish between the self-regulative and communicative speech functions. As a result, the self-regulative speech is no longer overt and is no longer restricted to communicative contexts. As Vygotsky put it, "... when egocentric speech disappears from view it does not simply atrophy but 'goes underground,' i.e., turns into inner speech." (1962, p. 18)

Vygotsky's view of how social speech gives rise to egocentric and inner speech was based on the ideas of several other investigators. Of course Piaget was very important in this regard since Vygotsky developed much of his argument about the function of egocentric speech as a criticism of the position held by Piaget (1926) at the time. In fact, much of Vygotsky's argument was originally developed in a long preface he wrote to the Russian translation of Piaget's early works. In addition, however, it is clear that many of Vygotsky's ideas about egocentric and inner speech grew out of his acquaintance with notions being developed by Soviet semioticians in the twenties and thirties. Thus, in the Russian version of Thought and Language Vygotsky (1956) cited the writings of Yakubinskii (1923) on dialogic speech. Also, Ivanov (1974) has argued that Vygotsky read Bakhtin and Voloshinov - Soviet scholars who were devising very interesting accounts of inner speech in the twenties.

Several of Vygotsky's students extended his ideas about how egocentric speech plays a crucial role in planning, organizing and regulating higher

mental functions such as perception, memory and problem solving. For example, Levina (in preparation) outlined the role of speech in planning problem solving efforts. The kinds of problems she used were similar to those that Koehler presented to apes.' Subjects are required to devise some kind of means to obtain a desirable object that is beyond their reach. This kind of problem intrigued Vygotsky and his students since Koehler's data provided a phylogenetically identifiable baseline with which they could compare the performance of subjects who were capable of transcending the immediately given situation through the use of a sophisticated sign system (i.e., egocentric speech). Like all of Vygotsky's students, Levina placed the development of egocentric speech within Vygotsky's overall theoretical framework involving the transition from interpsychological to intrapsychological functioning.

Planning for others is the first stage in the development of verbal planning. The social milieu which gives rise to the representation of action now turns out to be a major factor in understanding the source of planning. The first plan emerges when the child turns to the experimenter and reveals his/her future action and then carries it out. When spontaneous planning begins, it becomes possible to stimulate verbal planning... We see in general patterns of speech development: at first those surrounding the child direct his/her acts, then s/he comes to master his/her own behavior by the same means. This latter phenomenon is reflected in the child's egocentric speech which, not being socially oriented, is an adult form of behavior directed towards oneself. (In preparation, p. 12)

In this quotation we again see the interrelationship which exists among the first three themes in the theory of activity. Levina is using genetic explanation to identify the social origins of an historically developed sign system and how this system is used to mediate human psychological processes.

In reviewing various Soviet studies on egocentric and inner speech, it will be useful to keep in mind a set of distinctions proposed by A.A. Leont'ev (1977). He has distinguished among "inner speaking," "inner speech in the

strict sense," and "inner programming." These categories will be particularly useful when analyzing Luria's research since he was concerned with different types of inner speech at different points in his career.

According to Leont'ev, inner speaking is the "latent physiological activity of the articulatory organs that occurs in certain situations, and to some degree or other, imitates processes taking place during real speaking." (1977, p. 15) Soviet authors such as Sokolov (1963, 1969, 1972) have used electrontyographic studies to examine the subvocal functioning of speech mechanisms in various problem solving situations. Such studies have been concerned with whether or not inner speaking is present in various problem solving settings. Sokolov (1972) reports finding a strong relationship between the intensity of inner speaking and problem solving effort. According to him the incidence of inner speaking depends on several factors such as task difficulty and the degree to which the cognitive operations required by the task setting have become routine and automatic for a subject. Vygotsky undoubtedly would agree that studies of inner speaking can be useful in furthering our understanding of inner speech. However, it is clear that he did not equate inner speaking with inner speech. This is obvious from a close reading of the last chapter of his book Thought and Language (1962) as well as other statements he made in that volume. For example, at one point he stated that "The latest experiments show also that there is no direct correspondence between inner speech and the subject's tongue or larynx movements." (1962, pp. 42-48). Thus, his notion of inner speech did not necessarily entail the presence of the measurable behaviors which comprise inner speaking.

According to Leont'ev, "inner speech in the strict sense" is "the use of an inner speech code to solve some communicative (usually cognitive) task."

(1977, p. 15) This is the notion of inner speech that concerned Vygotsky and Luria when they dealt with the self-regulative function of egocentric and inner speech. Its importance quickly becomes evident when one considers statements such as, "the problem of speech and its role in the formation of mental processes occupies a special place in Soviet psychology." (Luria, 1969, p. 122) In many respects the term "speech" here can be misleading if one does not appreciate the overall theoretical framework into which it was introduced. Remembering that inner speech is not to be equated with inner speaking, a more accurate, but unacceptably cumbersome term would be "patterns-of-thinking-which-are-a-direct-reflection-of-genetically-prior-patterns-of-speech." Nothing in the way of subvocal activation, let alone overt phonation need to be involved. However, by retaining the word speech here, Soviet investigators have been able to emphasize that this phenomenon is best viewed as an internalized version of what was social interaction at a previous stage.

Investigators such as Vygotsky (1962) and Levina (in preparation) have investigated the role of "inner speech in the strict sense" and its precursor, egocentric speech, in the generation and execution of problem solving plans. Levina has pointed out that Vygotsky argued that "By representing what is basic, speech becomes the means for freeing the agent from the immediate field which prevails over the limited possibilities of visual cognition." (in preparation, p. 8) This quote emphasizes the fact that Soviets do not view the means used to mediate cognition simply as tools that facilitate processes that would occur in their absence. Rather, the mediation gives rise to processes that perhaps would not otherwise exist.

Luria (1957, 1959, 1960, 1961a, 1961b, 1969) and his colleagues (e.g., Luria and Yudovich, 1971; Tikhomirov, 1975; Yakovleva, 1975) conducted

several studies in the area of the regulative function of speech. While these studies used techniques involving overt speech, Luria's main purpose was to interpret the findings from the perspective of the genetic progression toward "inner speech in the strict sense."

When considering Luria's findings and how they fit into the overall Soviet account of the regulative function of speech, it is important to keep in mind that he was often concerned with neuropsychological factors. This led him to select experimental tasks which approached the notion of regulation from a neuropsychological perspective (i.e., the excitation and inhibition of motor responses) rather than using the more socio-semiotic perspective originally formulated by Vygotsky.

The experimental technique most often used by Luria involved children's ability to initiate or inhibit the motor act of squeezing a bulb in response to verbal commands. The commands and corresponding responses varied in complexity (e.g., "When the light goes on, press the bulb once." vs. "When the red light is on, press the bulb once. When the green light is on, press the bulb twice.")

On the basis of the data gathered by himself (e.g., Luria 1961b) and his colleagues (e.g., Tikhomirov, 1975; Yakovleva, 1975), Luria outlined three stages in the regulative function of the word. In Stage 1 (approximately 1½ to 3 years of age), the emphasis is on the capacity of adult speech to regulate children's motor responses. In this stage children were found to be capable of producing the correct motor responses only immediately after an adult's command, and they had great difficulty in storing "when... then..." commands and waiting for the first signal (e.g., a flashing light). Furthermore, children at this stage were unable to inhibit ongoing motor acts in response to an adult's command. The only effective way for an adult to

terminate a child's motor response at this stage was to use a command to initiate a new motor act (e.g., "Touch your knee." uttered by an adult when the child is to stop pressing the bulb).

In Stage 2 (approximately from 3 to 4½ years of age), children are capable of storing and carrying out the more complex "When... then..." commands, and adults' utterances become more effective in inhibiting a child's motor act. During this stage the child's own speech is capable of initiating, but not inhibiting his/her motor action. Luria interpreted this speech as a reflection of general cortical activation rather than as serving a regulative function based on meaning. His neuropsychological orientation becomes quite clear when he argues that the impulsive nature of speech is connected with "... the innervation of definite speech organs which create a center of excitation in the motor speech area of the cerebral cortex." (1961b, p. 51)

In Stage 3 (4½ years and beyond) children can follow the more complex commands of adults. Also, the children's speech takes on significantly greater regulative power and is able to be instrumental in inhibiting as well as initiating motor acts. Also, Luria argued that at this stage, the semantic aspect of the speech, rather than the motor speech act, played the main role in regulation. This interest in the qualitative transition in the regulative capacity of speech (i.e., from motor speech act to semantic aspects) was a longstanding and important concern for Luria (cf. Luria and Vinogradova, 1959).

In general, Luria's neuropsychological orientation complicates the issue of how his findings fit into the overall theoretical framework developed by Vygotsky. The two were clearly dealing with different aspects of the regulative function of speech. Whereas Vygotsky was primarily interested in the nature of social interaction processes which are mediated by sign

systems and how these processes are taken over and internalized by children, Luria was concerned with the specific neuropsychological mechanisms that make this transition possible. The two concerns need not be incompatible, but the choice of experimental tasks and techniques for data analysis have separated the two authors in important ways that are often not fully appreciated.

In addition to his interest in "inner speech in the strict sense," Luria was interested in the phenomenon Leont'ev has called "inner programming." This notion also grew out of Vygotsky's notion of inner speech, but in this case the emphasis is on how inner speech plays a role in the formulation of verbal utterances rather than in the planning and monitoring of cognitive processes. Leont'ev describes this phenomenon as "...the use of an inner-speech code to plan a speech utterance. (or, correspondingly, to retain its content in short-term memory, to remember it as a reference point in translating from one language to another, etc.)" (1977, p. 15-16) Thus inner programming is a phenomenon that concerns Soviet researchers in psycholinguistics (or, significantly, what is referred to in the USSR as the "theory of speech activity"). The origins of this line of research can be traced to the final chapter of Thought and Language where Vygotsky discussed the role of inner speech in speech production. A.A. Leont'ev (1969a, 1969b, 1974) has used this notion in his research on speech activity. He has argued that the inclusion of this notion in speech production models makes it possible to avoid what he views as the linguistic reductionism in western psycholinguistic research.

Luria (e.g., 1947, 1976) and his colleagues (especially T.V. Akhutina, 1975, 1978) have developed Vygotsky's original formulation in their attempt to devise models of speech production which would be useful in aphasiology.

Luria began to develop his ideas on this topic in Traumatic Aphasia (1947):

Studies of speech development by psychologists have shown that the transition from a thought to extended speech must be mediated by inner speech. However, since inner speech has an abbreviated and embryonic structure and is purely predicative in its function, it contains in latent form the germs of a subsequent dynamic schema of the sentence. The transition from inner speech to external speech amounts to an expansion, an unfolding of this preparatory schema, its transformation into the external, extended structure of a sentence (1947, p. 85-86).

Luria retained this basic position on speech production until his death.

Akhutina (1978) has summarized it as follows:

Luria, drawing on the studies of Vygotsky proposes a three-step model for the formation of an utterance: the motive; the thought and its transformation into inner speech; and external speech. Described in terms of the operations it entails, this model would look as follows: first, emergence of a motive; second, crystalization of the general intention, the germ of a thought (schema), expressed in inner speech; and third, recoding of inner speech into external speech. (1978, p. 7)

This notion of inner speech or "inner programming" has played an important role in Luria's (1976) and Akhutina's (1975) analysis of aphasia - especially in the case of what they term "dynamic aphasia."

Before leaving the theme of how historically developed sign systems mediate human activity, we should point out that Soviet investigators have devoted attention to the problem of how sign system activities other than speech can serve in this capacity. One form of this argument has been developed by Tikhomirov in connection with the role of computers in cognitive psychology. Tikhomirov (1977) has argued that approaches to artificial intelligence which are concerned solely with simulating human cognitive processes are usually weakened by their tendency to equate these processes with the manipulation of symbols - a form of reductionism that ignores major problems in the theory of activity such as motivation and goal formation. He sees an even greater problem to derive from the fact that the interest in using computers to simulate human cognitive processes has diverted investigators attention away from the most interesting and important question about the

relation between human cognition and the information processing operations carried out by a computer. He points out that a concern with drawing analogies between the two systems has led investigators to focus solely on the parallels and possibilities of "substituting" and "supplementing" elements of one system with elements of the other. Thus, in his critique of the "theory of substitution," he states:

If we accept the information theory of thought (i.e., the description of thought by analogy with the work of the computer), there can be only one answer to the question of how computers affect human thought: computers supplement humans in the processing of information, increasing the volume and speed of such processing... In the framework of the theory of supplementation, the relations between the functioning of humans and computer, if united into one system are the relations of two parts of one whole - the "processing of information." Together with the computer, humans process more information faster, and maybe more accurately. A purely quantitative increase in their resources takes place. (In preparation, p. 5)

In contrast to this general approach, Tikhomirov argues that the concern of psychologists should really be with how computers provide new possibilities for mediation of human cognitive activity and how this can influence the nature of this activity. According to him it is not the case that the integration of computer technology into human activity merely provides a quantitative extension of existing capacities. Rather, this new mediational means creates the impetus for a qualitative change in activity.

As the reader might suspect by now, Tikhomirov uses the genetic explanation method in developing his account of mediation:

Traditional Soviet psychology has been developed on the basis of the historical approach to the development of human mental processes. Vygotsky played a large role in establishing this principle. In analyzing practical activity, psychologists emphasize the tool as the most important component in human activity. This component creates the qualitative peculiarity of human activity in comparison with animal behavior. The tool is not simply added on the human activity. Rather it transforms it. For example, the simplest tool action - chopping wood - leads to a result which could not have been achieved without the use of the axe. The meaning of "tool action" expresses the combination of activation and human creative adaptation. The tools themselves serve as supplementing organs created by humans. The mediated nature of human activity clearly plays a leading role in the analysis of practical activity.

One of Vygotsky's central ideas is that mental processes change in

humans just as their processes of practical activity change, (i.e., the mental processes become mediated). The sign (language, mathematical sign, mnemotechnic means, etc.) emerges as such a mediational link. (In preparation, pp. 15-16)

After thus clarifying the assumption in his approach, Tikhomirov goes on to argue that:

...the question of the influence of computers on the development of human mental processes must be reformulated as follows: How does the mediation of mental processes by the computer differ from the mediation by signs? Does the new means introduce new changes into the very structure of intellectual processes? In other words, can we distinguish a new stage in the development of higher mental processes of humans? (In preparation, p. 17)

This approach not only forces investigators to use new techniques in examining the role of mediation in human mental processes; it leads them to pose a different set of questions than those that had interested them previously. Thus it follows that Tikhomirov would believe that:

The cases of greatest interest are not those when the computer takes over the solution of some problems solved earlier by humans (no matter how), but the cases of one problem solved jointly by humans and computer (i.e., "human-computer" systems proper). From our point of view, this type of system (and not those of "artificial intelligence") is of primary interest for the future of computerization..

Thus, we are confronted not with the disappearance of thought but with the reorganization of human activity and the appearance of new forms of mediation where the computer as a tool of mental activity transforms this very activity. We propose that the theory of reorganization reflects the real facts of historical development rather than the theories of substitution and supplementation. (In preparation, pp. 21-22).

### III.D. Internalization

The fourth major theme in the theory of activity concerns the issue of internalization. Since this term has already entered the vocabulary of western developmental cognitive psychologists due to Piaget's influence, it might at first appear that the Soviet position would have little new to offer. However, the fact that the Soviets' notion of internalization is embedded in a theoretical framework involving the other themes means that their inter-

pretation of this notion is unique in several respects. Thus, their emphasis on the social origins of activity has lead them to argue that what is internalized derives from socially defined activity. This fact distinguishes their approach from Piaget's in an important way since Piaget has been primarily concerned with the internalization of patterns of action which derive from the active subject's contact with objects in the physical world. The Soviet position on this issue is clearly stated in Vygotsky's (in preparation a) account of the development of the higher mental functions.

Any higher mental function necessarily goes through an external stage in its development because it is initially a social function. This is the center of the whole problem of internal and external behavior... When we speak of a process, "external" means "social." Any higher mental function was external because it was social at some point before becoming an internal, truly mental function. It was first a social relation between two people. (In preparation, pp. 18-19)

In addition to this argument about the role of social interaction in the ontogenetic process of internalization, the Soviet approach asserts that the activities with their attendant mediational means that are eventually internalized are socially defined. That is, we are once again reminded that Soviets are primarily concerned with historically evolved, socially defined activities. A.A. Leont'ev (in preparation) thus has argued that:

The initial ideas that led Vygotsky to investigate the genesis of internal mental activity from external activity are fundamentally different from the theoretical approaches used by other modern authors. These ideas came from his analysis of the features unique to human productive labor activity which is mediated by tools. This activity is initially social in nature. That is, it is developed only under conditions of cooperation and social interaction among people. Vygotsky identified two main, interconnected features that necessarily are fundamental for psychology: its tool-like ("instrumental") structure, and its inclusion in a system of interrelations with other people. It is these features that define the nature of human psychological processes. The tool mediates activity and thereby connects humans not only with the world of objects but also with other people. Because of this their activity assimilates the experience of mankind. This means that humans' mental processes (their "higher psychological functions") acquire a structure necessarily tied to the socio-historically formed means and methods transmitted to them by others in the process of cooperative labor and social interaction. (In preparation, p. 20)

More than any other Soviet psychologist, P. Ya. Gal'perin (1959, 1960, 1965, 1966a, 1966b, 1969, 1977) has studied the mechanisms responsible for internalization. Thus for him, "mental activity is the result of transferring external, material actions to the plane of reflection, to the plane of perception, representation, and concepts." (1959, p. 446)

Before considering the five stages in Gal'perin's account, it is important to note that he distinguishes between two basic parts of any mental action: the orienting aspect and the executive aspect. The orienting aspect of an action

...is the most important aspect of the psychological mechanism of an action. It defines the outline of each operation and guarantees control of the action in the process of execution. (1969, p. 251)

The executive aspect of the action is concerned with carrying out or executing the plan created by the orienting basis. According to Gal'perin, the orienting basis of an action determines its nature and chances for success. Not surprisingly then, his account of the formation of mental actions has focused on this aspect. The ultimate goal in this developmental process is the mastery of an act, and "To master an act means not simply to remember it, but independently to repeat it with new material and to obtain a new product from this material." (1969, p. 250)

The first stage in Gal'perin's account of the development of a mental action is to clarify its orienting basis for the subject, to familiarize the subject with the task and its conditions. For example, in the formation of mental actions in mathematical instruction Gal'perin's first step is to introduce the concept of a unit and several numbers to a child.

The second stage in his account involves carrying out the "action with material objects" or carrying it out in a "materialized form." Carrying out an action using material objects is viewed as appropriate for preschoolers, whereas carrying out an action in a materialized form is thought to be more

appropriate for older children. Gal'perin describes carrying out an action in materialized form as follows:

...this external form is not the same as it was for the young children. Rather, it is now any form of schema: diagrams, outlines, drawings, models, or simply written notes. All such representations accurately reproduce the characteristics and relationships of concrete-things which are important for the act and permit the subject to accomplish the act by using these substitutes. In all these cases we are speaking of an objective, materialized representation of thought properties and the relation between things. The objective schema is a materialization of these properties and relationships. (1969, p. 253)

In his account of how to teach counting skills Gal'perin has used various diagrams and has made written versions of the rule(s) involved available to children.

This second stage in the formation of mental actions thus makes the means used in the action maximally explicit at an external level. Gal'perin and his colleagues explicitly caution against efforts to move on to the following stages before mastery has been attained at this one. Without adequate participation in the action of this stage, they argue that further progress will be difficult, if not impossible.

The third stage in the formation of mental actions involves their formation in audible speech without the direct support of real objects or mediating props in a materialized form. While speech obviously is involved to some degree in the first two stages, El'konin argues that its role changes at this stage.

In the first and second stages, speech is primarily an indicator of the phenomena which reveal themselves spontaneously in perception. The pupil's basic task is to note these phenomena and master them. Then speech becomes the vehicle for the entire process, that is, both the objects of action and the action itself. In the early stages, verbal precision was not so important since that which had to be communicated was before one's very eyes. In the third stage, however, language emerges as a special, unique reality upon which the action relies. This reality has its own firm laws, whose basic requirement is communication. (1969, p. 260)

Like Vygotsky (in preparation b), Gal'perin argues that by transferring representation to the verbal plane, the action acquires much greater possibilities for abstraction and generalization.

When the act is transferred to the verbal plane, only the traits and characteristics of objects which are reinforced by separate words are selected as the meanings of the words. It is in the absence of the things themselves that they acquire abstract meaning. (1969, p. 262)

The speech Gal'perin is describing in this stage is still at the interpsychological plane since it functions in the communication between a child and another person (e.g., a teacher). In his examples of mathematics instruction, Gal'perin's procedure at this stage calls for the adult to remove the diagrams and other representational means having a materialized form and to rely solely on verbalization in regulating and mediating children's action.

The fourth stage in Gal'perin's account of the formation of mental actions involves the child's taking over the verbal mediation that had formerly been the responsibility of the adult. Thus, speech is now being transferred to the intrapsychological plane. This progression is the same one Vygotsky (1962, in preparation a) and Levina (in preparation) described in their account of egocentric speech. Like Vygotsky (1962), Gal'perin states that egocentric speech acquires some unique characteristics of form - especially abbreviation. Mathematics instruction at this stage involves the child reasoning aloud.

The fifth and final stage in Gal'perin's analysis involves the formation of actions through inner speech. Like Vygotsky (1962), he argues that the act and its representational means are abbreviated at this stage in such a way that they have undergone qualitative transformations and no longer are a direct reflection of the act as it was executed externally. Also, again following Vygotsky (1962), Leont'ev (1972) and other Soviet psychologists, Gal'perin does not view abbreviation as a process whereby the component parts of an action are retained

in a compressed or condensed form. Rather, the structure of the action changes during the five stages he outlines - especially in the transition to the last one.

The abbreviation of an operation and its transfer to the position of a "provisionally performed" operation does not mean the transition of this operation to the mental plane. On the mental plane the abbreviated operations are only presupposed, not executed. (1969, p. 257)

Thus, later forms may not bear a direct resemblance to earlier ones. However, this "phenotypic" difference (to use Vygotsky's (1978) term) does not decrease the importance of tracing the actual relations which are revealed in a genetic explanation. Such a line of reasoning is reflected in Gal'perin's notion that the process of abbreviation can properly proceed only after children have mastered an action at a conscious level.

But we emphasize that only conscious mastery of the abbreviation process can guarantee extensive transfer and the development of new action, a necessity in very difficult conditions. Only conscious development of abbreviation guarantees understanding of the connections between the operations he executes.

This connection not only permits the pupil to recover the full content of a mental act when he needs to, but also enables the student to keep the abbreviated contents "in mind" during the execution of an action. (1969, p. 256)

In this quotation, it is evident that Gal'perin is claiming that while internalized, mental actions bear a direct resemblance to their external precursors, the genetic relationship is important. This is clearly reflected in cases where problems emerge in the functioning of an internal operation and the need arises for "re-externalizing" it. In his analysis of mathematics instruction, Gal'perin sees performance at this fifth stage as being manifested by silent, independent processing.

We should note that Gal'perin has stated that the five stages he has outlined will not necessarily reveal themselves in five neatly distinguished segments. For example, processing at the fifth stage may begin in connection with one aspect of a task while other aspects can only be executed at the

second stage.

This account of internalization thus has many features which characterize the Soviet theory of activity. For example, the notion that social interaction, or functioning at the interpsychological plane is inherent in the first three stages, and a transition to the individual or intrapsychological plane is seen at the fourth stage. Also, the Vygotskian claim that the mediational means (schemas, speech) used on the interpsychological plane will be the same means used on the intrapsychological plane is inherent in Gal'perin's account. Thus, this five-stage model can be viewed as an effort to specify and elaborate on the theoretical implications found in Vygotsky's writings. Gal'perin's account of the formation of mental actions has played an important role in the development of the theory and practice of instruction in the USSR. In particular, one of his colleagues, N.F. Talyzina (1957a, 1957b, 1969, Gal'perin and Talyzina 1957) has proposed specific procedures to be used in instructional settings.

### III.E. The Structure of Activity

Up to this point we have dealt with themes in the theory of activity that derive from the writings of Vygotsky and to some degree, Rubinshtein. The final two themes we will examine are examples of how certain theorists - especially A.N. Leont'ev - have expanded upon the theoretical outlines provided by these figures. The first of these themes has to do with the structure of activity.

Leont'ev (in preparation) has outlined three levels of abstraction or analysis in the study of activity. At the first level he focuses on the notion of a specific activity and its associated motive (motiv). One should note here that when dealing with this level, Leont'ev is no longer speaking of activity in the generic sense (i.e., he is no longer speaking of the theory

of activity in general). Rather, his analysis has shifted to particular activities. He defines an activity as:

...the nonadditive, molar unit of life for the material, corporeal subject. In a narrower sense (i.e., on the psychological level) it is the unit of life which is mediated by mental reflection. The real function of this unit is to orient the subject in the world of objects. In other words, an activity is not a reaction or aggregate of reactions, but a system with its own structure, its own internal transformations, and its own development. (in preparation, p. 8)

One of the main reasons for Leont'ev's inclusion of this level of analysis in his theoretical framework is that it provides a link between human psychological processing and the sociological framework of a society. An activity is concerned with a level of analysis that is seldom included in western approaches to cognitive psychology. It is not so much something that a human consciously does - this is the issue at the levels of analysis concerned with actions and operations. Rather, an activity is the broader framework of implicit assumptions and expectations within which actions and operations are carried out. These assumptions and expectations are generated by, and a part of, a society's institutions and practices. The notion in the west that is perhaps closest to Leont'ev's activity is that of a "frame" as understood by Goffman (1974).

Among the activities mentioned by Leont'ev and his colleagues are play, instructional (i.e., formal educational) activity, and vocational activity. This list provides an important clue to a fundamental fact about activities - they are defined by the social relations that exist in a culture. According to Leont'ev:

Human psychology is concerned with the activity of concrete individuals which takes place either in a collective - jointly with other people - or in a situation where the subject deals directly with the surrounding world of objects - at the potter's wheel or at the writer's desk. However, if we remove human activity from the system of social relationships and social life, it would not exist and would not have any structure. With all its varied forms the human individual's activity is a system within the system of social relations. (in preparation, p. 8)

Notice that this says nothing about the specific goal-directed cognitive actions and operations that will actually be used to instantiate an activity. To say that an individual is engaged in a particular activity simply tells us that s/he is part of some general context which can be defined in terms of societal institutions. While identifying the activity in which someone is engaged does not specify the cognitive actions and operations involved, Soviets would argue that it is an important step in coming to understand human cognitive functioning. Thus Leont'ev argues that it is possible for humans to know the world only by engaging in the succession of activities which comprise the process of living.

In activity the object is transformed into its subjective form or image. At the same time, activity is converted into objective results and products. Viewed from this perspective, activity emerges as a process of reciprocal transformations between the subject and object poles. (in preparation, p. 8)

Any activity is associated with a motive which impels it but does not specify the direction it will take. This latter problem is the concern of other levels of analysis in Leont'ev's system. Thus, a child who is engaged in instructional activity with its associated motive may carry out any one of a variety of actions and operations.

One of the most important ways that the notion of an activity has been utilized in Soviet approaches to cognitive psychology can be found in the account of ontogenetic change devised by Leont'ev and D.B. El'konin. They have proposed that by analyzing the "leading" or "dominant" activities during various periods in a child's life, we can understand not only what these different periods are but also why the child progresses from one period to the next. Leont'ev introduced this notion as follows:

At a given stage some types of activity will be more prominent and more significant for the further development of personality, and other forms of activity will play a minor role. That is why we should

speak of the dependence of mental development not on activity in general, but on the dominant form of activity. In accordance with this we might say that each stage of mental development is characterized by one dominant relationship of the child to his/her environment, by one dominant activity within that given stage.

The indication of a transition from one stage to another is precisely a shift in the dominant type of activity, the dominant relationship of the child to his/her environment. (1972, pp. 501-502)

It is important to note that in this account a dominant activity is not necessarily the one in which an individual participates most frequently. Rather, it is dominant because it leads an individual into a new developmental stage. Leont'ev (1972) also points out that the dominant activities available for fulfilling this ontogenetic role will differ at various points in socio-cultural history - a point we will return to later.

El'konin (1972) has been the investigator primarily responsible for developing Leont'ev's ideas further. One of the major tenets of El'konin's research has been that in order to provide an adequate account of cognitive development we must take affective and motivational factors into account. This again points out that the motive is a necessary part of any account of an activity. Thus a more complete description of his research would refer to "dominant activities and motives." His criticism of Piaget is based on this tenet.

Perhaps the clearest concept of an intellectual development divorced from the development of the need-affective sphere is that contained in the theories of J. Piaget...The principal shortcoming of this view lies in its inability to explain the transitions from one stage of intellectual development to the next...

Thus a peculiar dualism is read into mental development, which is then seen to follow two basic and parallel lines: the line of development of the need-motivational sphere and the line of development of the intellectual (cognitive) processes. It is this dualism and parallelism that we must overcome in order to understand the mental development of the child as a unitary process. (1972, pp. 233-234)

In order to avoid this dualism, El'konin proposes that we examine the dominant activities and motives at various ontogenetic stages in terms of how they

further both a child's "need-motivational sphere" and "operational and technical abilities." He argues that ontogenetic progression involves stages of development in the need-motivational sphere which alternate with stages of primary development in operational and technical abilities. Each of his three major periods in ontogenesis consists of two of these stages which make up one alternation.

...each period consists of two regularly connected stages. The first of these is the stage dominated by the learning of the objectives, motives, and norms of human activity and by the development of the need-motivational sphere. At this point preparation is made for the transition to the second stage, dominated by the acquisition of modes of action with objects and the development of operational and technical abilities. (1972, p. 248)

The following comments by El'konin (1972) give an indication of what constitutes the two stages in each of the three periods.

| <u>Period</u>      | <u>Stage</u>       | <u>Description</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Early childhood | A. Infancy         | ...direct emotional contact with the adult represents the dominant activity of the infant; it is against the background of this activity that orienting, sensorimotor, and manipulative actions take form (1972, p. 241)                                                                                                                                                                                                                                                                                              |
|                    | B. Early Childhood | Immediate emotional contact with the adult recedes to a subordinate role; the dominant role is now taken over by strictly practical cooperation in the activity at hand. The child is absorbed in the object and his manipulations of it. (1972, p. 241)                                                                                                                                                                                                                                                              |
| 2. Childhood       | A. Preschool       | ...the dominant preschool activity is play in its most expanded form (role-playing). Role-playing is an activity within which the child becomes oriented toward the most universe, the most fundamental, meanings of human activity. On this basis the child begins to strive for socially meaningful and socially valuable activity, and in so doing demonstrates the key factor in readiness for school. This is the chief significance of play for mental development; it is the dominant function. (1972, p. 243) |

B. Early School The activity of formal learning, i.e., that activity through which the child acquires new knowledge and for which a system of instruction should provide proper guidance, is the dominant activity in this period...The primacy of formal learning is also reflected in the fact that it is this activity that mediates the whole system of the child's relations with surrounding adults (down to personal contact with the family). (1972, p. 244)

3. Adolescence A. Early In recent years investigations conducted under D.B. El'konin and T.V. Dragunova (1967) have shown that a special activity emerges and develops in adolescence, an activity that consists in the establishment of intimate personal relations between adolescents. This activity has been termed the activity of social contact. It differs from other interrelations that occur in practical cooperation between peers in that its principal content concerns another adolescent as a human being with definite personal qualities. (1972, p. 245)

B. Later ...vocational or career-oriented activity (1972, p. 247)

Thus we see that El'konin argues that we must approach the analysis of ontogenesis from the perspective of what activity is dominant at each stage. This provides the milieu within which specific aspects of cognition develop.

This approach of dominant activities as developed by Leont'ev and El'konin has guided a great deal of Soviet research on cognitive development. For example, Markova (1971, 1973, 1977) has developed an analysis of the ontogenesis of speech functions and related cognitive functions on the basis of stages of dominant activity. Her analysis identifies the kinds of speech activity (speech functions) and the linguistic means (forms) that characterize each stage. For example, during the first stage (Infancy) of the first period identified by El'konin (Early Childhood), Markova (1977) argues that speech functions primarily to allow socio-emotional contact and the naming of objects and that the forms that make this possible are cooing and babbling and the

syllabic contour of words. In contrast, during the first stage (Preschool) of the second period (Preschool) Markova identifies the major speech functions as social contact (regulation and influence of specific actions) and self-regulation (planning of specific actions). In connection with this stage she identifies the linguistic means which make this possible - monologic context - forming speech, inner speech, and the phonetic composition of words or the word as an object of consciousness (in learning to read).

Lisina and her colleagues have developed another line of research which is closely related to the notion of a dominant activity at various stages of ontogenesis. In her analysis she emphasizes the notion that the relationship between adult and child will change with changes in the dominant activity. For example, in one study (Lisina, 1974) she encouraged parents to provide a very high level of emotional input (e.g., carressing, responding positively to any expression of pleasure by the infant, etc.) for ten weeks when infants were between the ages of 2½ and 4 months. Lisina reports that in comparison to infants in a control group, these children demonstrated enhanced affective development as well as superior skills in other areas such as grasping and manipulating objects, prolonged play with toys which were placed in their hands, and inhibition of impulsive actions.

In a recent review, Lisina (1978) has reported on some of the research her colleagues have conducted adult-child studies with older children. For example, Vetrova (1975) and Elagina (1977) have written doctoral dissertations on the effects of adult interaction in task settings with 2-year-olds. These investigators examined the processes by which children learn when and how to recruit adult assistance in a task (e.g., retrieving an object from a high shelf) that they cannot carry out independently. Lisina summarizes their findings by observing that such adult-child interaction in task settings

"creates the conditions for further development of activity with objects and also is the context for the emergence of active speech in early childhood." (1978, p. 77) Two other students, Miteva (1974) and Smirnova (1975, 1977) have carried out studies of how older preschool children participate in social interaction with adults. The main concern of their research was with how children develop into the role of an apprentice or student under an adult's guidance.

The main problem addressed by Lisina and her students is how social interaction changes in connection with the various dominant activities in which a child engages. They stress that as a child's dominant activity changes so does the nature of social interaction, especially social interaction with adults. Furthermore, they argue that changes in dominant activities result from changes in the social interactional milieu of the child.

As mentioned earlier, Leont'ev and his colleagues argue that the repertoire of dominant activities will change throughout history. Such a position of course should not be surprising given the fact that the theory of activity grew out of Vygotsky's socio-historical approach. One body of Soviet research that can be interpreted from this perspective is the cross-cultural research of Luria (1976) and his students. They have been particularly concerned with how the instructional activity found in formal educational institutions influences reasoning processes.

For example, one of Luria's students, Tulviste (1975a, 1975b, 1977a, 1977b, 1978, in press), has carried out a series of cross-cultural studies which examine how the introduction of formal education into a society influences the syllogistic reasoning processes. In one of his most recent studies Tulviste (1978) identified "transitional" subjects who sometimes, but not always, incorporated into their syllogistic reasoning information which was

not specifically mentioned in the premises. Among these subjects, he reported that "theoretic" explanations (i.e., those that relied solely on the information found in the syllogism) first appeared in the sphere of school knowledge and only afterwards appear in the sphere of everyday knowledge. He interprets these findings in terms of how thinking processes can be transformed by the introduction of formal education and how thinking may vary among cultural-historical groups. In particular, he has been concerned with the origins and development of what Vygotsky (1962) called "scientific concepts."

It seems reasonable to propose that theoretic syllogistic reasoning (and thinking in "scientific concepts" in general) should appear in children and in adults in a certain culture only when certain modes of texts function there that demand those modes of thinking and, respectively, produce them (at school or outside school). Tulviste (1978, p. 17)

Tulviste's cross-cultural studies provide one of the best examples of research which has grown out of a great deal of cross fertilization between western and Soviet psychology. He relies heavily on western authors such as Cole and Scribner who, in turn, have developed many of their ideas on the basis of the theoretical foundations proposed by Luria and Vygotsky.

The second level of analysis in Leont'ev's theory of activity is that of an action (deistvie). According to him:

The basic "components" of various human activities are the actions which translate them into reality. We call a process an action when it is subordinated to the idea of achieving a result, i.e., a process which is subordinated to a conscious goal. Just as the notion of a motive is tied to an activity, the notion of a goal is connected with the notion of an action...Of course, the motive fully retains its energizing function, but the directive function is another matter. The actions which constitute activity are energized by its motive but are directed toward a goal. (in preparation, pp. 24-25)

According to Leont'ev, one of the main reasons for distinguishing between activities and actions is that entities at the two levels can vary independently of one another.

One and the same action can be instrumental in realizing different activities. It can be transferred from one activity to another thereby revealing its relative independence. Let us turn once again to a simple illustration. Assume that I have the goal of getting to point N and I carry it out. It is clear that this action can have completely different motives, i.e., it can realize completely different activities. The converse is also obvious: one and the same motive can give rise to different goals and accordingly can give rise to different actions. (in preparation, p. 25)

Leont'ev has always argued that the theory of activity must not only be able to identify the type of unit that exists at each level of analysis, but must also be able to specify the interrelationships among these units. This claim is perhaps nowhere better illustrated than in his account of the relationship between actions and activities. The fundamental concept used in his analysis of this relationship is that of sense (smysl) or personal sense (lichnostnyi smysl).

The notion of sense as used by Soviet psychologists grew out of the writings of Vygotsky (1962). For Vygotsky, sense was a semiotic notion which is to be contrasted with meaning (znachenie). As we noted earlier, there is reason to suspect that Vygotsky's account of this distinction benefited from discussions with the cinematographer Eisenshtein (1970) who was developing similar ideas under the headings of image and representation. Vygotsky also relied on the ideas of linguists in developing this notion. For example, in Thought and Language, Vygotsky attributes the original formulation of the distinction between meaning and sense to Paulham.

The sense of a word, according to him [i.e., Paulham - JWV] is the sum of all the psychological events aroused in our consciousness by the word. It is a dynamic, fluid, complex whole, which has several zones of unequal stability. Meaning is only one of the zones of sense, the most stable and precise zone. A word acquires its sense from the context in which it appears; in different contexts, it changes its sense. Meaning remains stable throughout the changes of sense. The dictionary meaning of a word is no more than a stone in the edifice of sense, no more than a potentiality that finds diversified realization in speech. (1962, p. 146)

Thus we see that Vygotsky's notions of sense and meaning evolved out of his semiotic analysis. Luria (1976, 1977) has to a large extent retained this distinction in his writings on aphasia. Leont'ev, on the other hand, has modified Vygotsky's semiotic distinction between sense and meaning somewhat in order to utilize it in his theory of activity. Specifically, the notions have evolved under Leont'ev's treatment so that they play an important role in understanding the relationship between an activity and the action(s) used to translate it into reality. When trying to understand Leont'ev's notion of personal sense, it is important to understand its origins in Vygotsky's writings, but it is also important to realize how Leont'ev has molded it to fit into his theory of activity.

For Leont'ev, meaning is concerned with what one might call the "cognitive facts" or the "cognitively defined goals" that a psychological analysis might provide, whereas sense is concerned with the role that these phenomena played in an individual's stream of life or activities with all their affective and subjective aspects.

In some cases the lack of correspondence of sense and meaning in consciousness is quite clear. For instance, one may be thoroughly acquainted with some historical event, one may have a precise understanding of the meaning of some historical date. However, the sense of this date may vary for an individual. It may have one sense for a youth who has not yet left his/her school desk but another for the same youth when in a position to sacrifice his/her life in battle to defend his/her homeland. Has his/her knowledge of this event, this historical date changed or grown? No. Maybe this knowledge is even less precise, maybe something is even forgotten. But somehow this event is now remembered. It enters his/her mind. And it turns out that it is elucidated in his/her consciousness somehow in a completely different light, somehow with a fuller content. It becomes different, but not in its meaning, not from the perspective of knowledge about it, but from the perspective of its sense for the individual personality. It takes on a new, deeper sense. (1972, p. 293)

From this passage, one can see that Leont'ev has changed the focus from the meaning and sense of words to the meaning and sense of events and general psychological experience. In a footnote he specifically recognizes this

distinction and reminds the reader that in some cases he uses the word meaning (znachenie) in connection with the meaning of a word, and in other cases he is using the term in connection with knowledge or "the general content of social consciousness which an individual acquires." (1972, p. 327)

In connection with the issue of how the notion of sense fits into the theory of activity, we see that Leont'ev (1972, 1978, in preparation) was concerned with the issue of how sense expresses the relationship between an action (with its goal) and an activity (with its motive). In his writings he has produced several examples which illustrate this relation. One of them is the following:

In order for an action to emerge it is necessary that its object (its immediate goal) be consciously realized in its relationship with the motive of the activity in which this action is included. This is an extremely important point. From this it follows that the goal of one and the same action can be consciously realized in different ways, depending on the connections it has with the motive of the activity. This changes the sense of the action for the subject.

Let us turn to an example.

Let us imagine that a child is trying to solve a particular problem which has been assigned in his/her homework. S/he of course is conscious of the goal of his/her action. It is to find the required solution and write it down. His/her action is directed toward this goal. But how is this goal consciously understood, i.e., what sense does this action have for the child? In order to answer this, we must know the activity in which this action is included or, what amounts to the same thing, what is the motive that energizes this action. Maybe the motive here is to master arithmetic; maybe it is to avoid angering the teacher; or finally, maybe it is simply to make it possible to go out and play with one's friends. In all of these cases the goal is objectively the same - to solve the assigned problem. But the sense of this action for the child is different in the various cases. Therefore, the same action will be psychologically different for him/her. (1972, p. 515)

Many western psychologists will be tempted to interpret Leont'ev's notion of sense as an effort to reintroduce affect into a theory of cognitive psychology. In fact, it is possible to find comments of Soviet psychologists which seem to support such an interpretation. However, Leont'ev and his colleagues do not accept such a simple, dichotomous distinction between cog-

nition and affect. They do not view themselves as making the simple claim that various affective shadings can be attached to one and the same, independently defined cognitive process. In particular, they would argue that one cannot study an action in isolation and then "add on" the motive.

One of the best studies that illustrates the integral and reciprocal relationship between an activity and an action was conducted by Istomina (1977) under Leont'ev's supervision. Istomina examined young children's ability to remember a list of items in two different settings - an experimental task setting (i.e., formal experimental or instructional setting) in which the children were given the goal of remembering items because the experimenter asked him/her to do so, and a play setting in which memory actions emerged in the course of play activity. In this play activity the children were given a list of items which they had to remember until they arrived at a "store" and could purchase them. The children in Istomina's study ranged from 3 to 7 years of age (i.e., El'konin's "Preschool" stage in which play is the dominant activity). Her main purpose was to examine the ontogenesis of the ability to formulate the goals and execute the actions required in a memory task situation. She found that children's memory performance and understanding of the task were consistently better in the play situation than in the setting of a laboratory experiment. For example, while the young preschoolers' performance was often quite poor in the play situation, it was sometimes completely inappropriate in the experimental setting.

... in these experiments we encountered in some of the youngest children a kind of behavior that was never encountered in the play situation. Specifically, there were cases in which the children did not at all grasp the assignment, and their behavior unfolded independently, as it were, of the instructions the experimenter had given them.

For example, Slava L. (three years, three months) glanced off to the side when the list of words was read to him. When asked by the experimenter to tell what words he had heard, he remained silent and then asked in bewilderment: "Where are they?" (record No. 63) (1977, p. 131)

Istomina also reports that in the case of the older subjects in her study,

memory performance was consistently superior first in the play setting and only later in the experimental setting.

Istomina's claim is not simply that children made greater efforts in the play setting because it was more enjoyable or affectively appealing.

Rather, her argument is that

...the development of retention and recall as internally purposeful acts takes place initially as part of a broader, articulated, and meaningful activity (since it is only within the context of such activity that the specific acts of remembering and recall can have any meaning for a child)... (1977, pp. 103-104)

Although Istomina conducted her research at a time (the late 1940's) when Leont'ev's theory of activity was still in its early stages of formulation, her interpretation of findings clearly was heavily influenced by his notions of an activity and an action and the relationship between them. Thus Istomina argues that

For something to become the goal of an act, it must stand in some relation to what gives rise to the child's activity, i.e., to the motivation for an act. It is this relationship that gives meaning to the goal, and consequently to the act corresponding to the goal (Leont'ev, 1947). Thus the differentiation and awareness of a goal on the part of the child depend not only on the existence of objective conditions and on the requirements imposed by those conditions but also on the motivation provoking the child's activity in the first place. Therefore we had to explore how mnemonic acts - remembering and recall - were formed in situations in which the underlying motivation of the act varied. (1977, p. 153)

Istomina's findings at first glance seem to contradict Leont'ev's claim that one and the same action may be executed in connection with different activities. After all, one of the major claims of her study is that children may be able to execute an action in the context of one activity but not in the context of another. This is an important fact about the performance of young children, but Istomina and other Soviet psychologists have also claimed that one of the major accomplishments in ontogenesis is that the child gains voluntary control over actions. In the terms of the theory of activity this

this means that children develop the ability to carry out specific actions in a variety of activity contexts. By developing voluntary control over actions, the child thus "liberates" them from the original activity in which they occurred. Actions still take on different personal senses, depending on the activity and motive with which they are associated, but the relationship is much less constrictive. It is also important to point out in passing that since the time of Vygotsky's writings, Soviet psychologists have viewed instructional activity as being one of the most important means responsible for this liberation - a claim very similar to that of Cole and Scribner in the west.

From this explication of activities and actions one can see that the two notions are functionally defined in the sense that their description cannot be reduced to formally defined segments of behavior. The crucial point is what function a particular behavioral segment serves in the subject's overall activity. One of the important strengths that Soviets see in the functional approach inherent in the theory of activity is that it allows them to avoid various forms of reductionism. Zinchenko and Gordon (in preparation) have argued that a theoretical approach based on activity obviates the need for neurophysiological, informational-cybernetic, and logico-pedagogical (e.g., Piagetian) forms of reductionism.

The third level in Leont'ev's analysis of activity is the operation (operatsiya). Just as an activity is associated with a motive and an action is associated with a goal, an operation is associated with the conditions under which it is carried out.

Another important aspect of the process of goal formation is making the goal concrete or selecting the conditions of its attainment. But this topic deserves special attention. Any goal - even one such as "reaching point N" - exists objectively in some objective situation. Of course the goal can appear in the subject's consciousness in abstraction from this situation, but the same cannot be said for the action. Thus, apart

from its intentional aspect (what must be done) the action has its operational aspect (how it can be done) which is defined not by the goal itself but by the objective circumstances under which it is carried out. In other words, the executed action is in response to a task. The task is the goal given in certain conditions. Therefore, the action has spiral qualities, its own special "components," especially the means whereby it is carried out. I shall label the means whereby an action is carried out is operations.... If we imagine a case in which the goal remains the same and the conditions in which it is given change, then only the operational composition of the action changes. (In preparation, pp. 28 - 29)

In examining Leont'ev's notion of an operation, it is important to note that V.P. Zinchenko and his colleagues (e.g., Zinchenko 1972; Zinchenko, Munipov and Gordon 1973; Zinchenko and Gordon 1976) have extended the theory of activity beyond the level of an operation by proposing a fourth level of analysis - the functional block. This unit of analysis is concerned with the specific psychophysiological mechanisms that play a role in the unfolding (i.e., microgenesis) of the operations involved in an action. Zinchenko and his colleagues have conducted a series of studies in which they examine the functional blocks involved in a task such as using a lever to move a spot on a television screen in accordance with a pre-established path. Not surprisingly, genetic explanation plays a major role in his analyses. Specifically, they have been interested in the microgenesis of the various functional blocks within a particular operation. At two of his levels of analysis (his "microanalysis" and "microstructural analysis"), he has identified and studied the three following stages involved in carrying out the task: the latent stage at the beginning of the movement, the phasic (movement) stage, and the stage of control and correction. Kochurova, Visyagina, Gordeeva and Zinchenko (in preparation) propose that each of these stages (which can be studied empirically using a variety of measurement devices) corresponds to a functional block.

There is a block of the formation of programs of motor instructions, a block of execution or realization of programs and, finally, a block of control and correction. (In preparation, p. 15)

By analyzing how these stages and the transformations among them change over the course of a training session (another form of microgenetic analysis), Kochurova et al. have found that

In the course of the formation of a spatial skill, our microanalytic data show that there is not only a change in the relative importance of the functional blocks in the overall action. In addition, there is an essential change within the structure of these blocks themselves... (In preparation, p. 15)

Thus we see that the theory of activity allows the psychologist to analyze a segment of behavior at a variety of levels. There is no single level of explanation that is considered to be capable of providing the explanation of the data. As an aside we should note that it is not the case that the levels of analysis are distinguishable merely on the criterion of the size of the segment of processing. That is, it is not the case that the only difference between activities and actions is that the former can be divided into several of the latter. While it will often be true that several actions are involved in one activity, it is entirely possible for there to be only one action involved. Thus the level of analysis or abstraction is the issue here - not the "size" of the unit.

We should also note that while Soviet psychologists' arsenal of analytic methods involves these several levels, this does not mean that they are free to choose one at random and ignore all the others. Rather, the approach argues for an integrated account of human activity which involves all the levels and the interrelations among them. Zinchenko and Gordon (in preparation) have made this point as follows.

The main relationship which ties the units of activity together is a genetic one. It is the relationship of transitions of one set of units into others in the course of an activity's development [i.e., microgenesis of the second type outlined above - J.V.W.] Naturally, this last idea determines the main method for investigating mental phenomena - the causal-genetic method to which Soviet psychology owes its most important advances.

In addition, the various relationships among the components of the objective content of activity characterize in every concrete instance the specific structure of an activity. (In preparation, p. 3)

This quotation reflects the fundamental assumption in Soviet psychology that the proper analysis of psychological phenomena must take into account all their complexity and interrelationships.

### III.F. The Goal-Directedness of Actions

This final theme in the theory of activity has already been outlined in our account of the preceding theme. However, the notions of goal and the goal-directedness of an action has played such an important role in the formation of empirical research questions that we will identify it as a major theme in order to devote special attention to it.

As mentioned earlier, it is possible for a single goal-directed action to be involved in different activities. The relation between an action and an operation has also been examined in the theory of activity. For example, Leont'ev has stated that:

Every operation is the result of the transformation of an action. This transformation occurred as a result of its inclusion in another action and its ensuing "technicalization." A very simple illustration of this process is the formation of the operations required, for example, to drive an automobile. Initially, every operation - for example, shifting gears - is formed as an action subordinated to a goal. Such actions have their conscious "orienting basis" (Gal'perin). Subsequently, this action is included in another complex action such as the action of changing the speed of the automobile. At this point, shifting gears becomes one of the methods for carrying out this action. It is no longer carried out as a special goal-directed process. The driver does not distinguish its goal. As far as the driver's conscious processes are concerned, it is as if shifting gears under normal circumstances does not exist. S/he is doing something else: s/he is driving the automobile from place to place, driving up steep inclines and across level expanses, bringing it to a stop in certain places, etc. (In preparation, pp. 29-30)

As is evident from this passage, a major difference between an action and an operation is the level of consciousness at which psychological processing is carried out. Cognitive psychologists in the U.S. have refrained from dealing with the issue of levels of consciousness because of the difficulties in defining and operationalizing it. While Soviet psychologists have by no

means settled all these issues, the problem of consciousness has continued to play a major role in their approach, and in the specific case of the distinction between an operation and an action, this notion has allowed them to integrate several findings and hypotheses in a way that would otherwise be nearly impossible.

As is the case with other issues in the theory of activity, the original theoretical formulation of this point can be found in the writings of A.N. Leont'ev, but the empirical studies were conducted by his colleagues. The writings of P.I. Zinchenko (1962, in preparation, Smirnov and Zinchenko 1969; Zinchenko and Sereda 1964) are particularly important in this regard. P.I. Zinchenko spent many years conducting studies of "involuntary memory." The phenomena he examined would fall under the term "incidental learning" in the U.S. For example, Zinchenko (in preparation) reported an experiment in which he asked university students to solve five arithmetic problems such as:

Two pieces of material contained ninety-seven meters of material. There were twenty-six meters in one piece. How many meters of material were in the second piece? (in preparation, p. 5)

After the subjects had solved all five problems, they were given an unexpected recall task in which they were asked to list the numbers that had been used. He found that university students recalled an average of only 3.8 out of the 15 numbers involved. In a second condition in this study, subjects were asked to devise five problems, each involving one arithmetic operation with numbers less than 100. In this condition, the unexpected-recall task yielded an average of 9.7 out of 15. Finally, in a third condition ("Partial devising of problems") university students were given the numbers and the arithmetic operation and were asked to devise a problem using this information. In this condition, the score from the unexpected recall task dropped to 4.7 out of 15.

Zinchenko's experimental design and findings are similar to those reported

by several authors in the west. Thus, up to this point we have an instance in which the same procedure and findings are generated out of two different theoretical orientations. However, Zinchenko's theoretical explanation for these results differs from that typically found in the west, and this in turn led him to follow up this study with different hypotheses and experiments.

First let us turn to his theoretical explanation of his findings.

Zinchenko interpreted his techniques and findings from the perspective of the theory of activity then being developed by A.N. Leont'ev (1941, 1944, 1945).

Our task in studying involuntary memory is to reveal the specific features of activity that create the most favorable conditions for involuntary recall. To carry out this task, we must establish a psychological analysis of activity itself. (Zinchenko, in preparation, p. 1)

Zinchenko's studies were primarily concerned with whether the subjects in his experiments carried out the cognitive processing required as an action or as an operation. His basic experimental method was to devise two tasks in which one and the same set of materials would play different roles in subjects' activity. In one case, the task was devised such that the material would be directly concerned with goal directed action (i.e., the second experimental condition outlined above), whereas in the other case the material would simply be a means (or operation) involved in carrying out the action (i.e., the first experimental condition outlined above). One of his main conclusions from these studies was that:

1. Material that is the immediate goal of an action is remembered concretely, accurately, more effectively, more durably. When related to the means of an action (to operations) the same material is remembered in a generalized way, schematically, less effectively, and less durably.  
(In preparation, p. 17)

In addition to the findings and theoretical explanation outlined above, Zinchenko's use of the theory of activity led to other studies. A particularly interesting result derived from Leont'ev's notion that "Every operation is the result of the transformation of an action." (Recall the example of

shifting gears in an automobile outlined earlier.) As noted earlier, Zinchenko interpreted his results in the involuntary memory experiment with university students in terms of whether the subjects were processing the numbers in connection with the goal of an action or in connection with operations or means required to reach the goal. When the task was carried out such that subjects processed the numbers in the first way, their involuntary memory for the numbers was greater than when they processed the numbers in the second way. One of the questions which the theory of activity raises in connection with this finding is concerned with what would happen if one could find subjects for whom the arithmetic processing could not be carried out at the level of an operation. That is, what would happen to involuntary memory in the case where the same arithmetic processing had not yet been transformed from an action into an operation? In order to answer this question Zinchenko conducted the same experiment with first-grade subjects. He hypothesized that whereas adults would carry out the arithmetic processing in the first and third conditions at the level of operations, such processing would be impossible for first-graders. For them, the addition and subtraction involved would have to be actions with their attendant conscious goal. His findings were that the involuntary memory scores for the first graders were 11.1 (versus 3.8 for the college students) in the first condition (solving a problem with numbers provided by the experimenter), 12.2 (versus 9.7 for the college students) in the second condition (selecting one's own numbers and devising a problem), and 11.5 (versus 4.7 for the college students) in the third condition ("partial devising of problems" with the numbers supplied by the experimenter). On the basis of these results, Zinchenko concluded that:

It is clear that the addition and subtraction of two-digit numbers by subjects at different grade levels are connected with different types of mental activation. For first graders, addition and subtraction are still independent, goal-directed actions. For third graders and even

more so for adults they are converted into automatic and highly developed intellectual operations or habits. This means that if our proposal is correct, first graders should have higher recall scores for the numbers. (In preparation, p. 10)

In addition to these experiments, Zinchenko and his colleagues have carried out many others that examine various aspects of voluntary and involuntary memory within the framework of the theory of activity.

It is important to note that the phenomenon that was of interest to Zinchenko is not the same phenomenon studied recently in the west under the "levels of processing hypothesis" proposed by Craik and Lockhart (1972). Zinchenko's concern was with the level of consciousness as defined in the theory of activity at which information is processed. Subjects in his studies were always required to carry out the "same" arithmetic manipulations, but they could do so at a higher or lower level of consciousness, depending on whether an action or an operation was involved. In studies generated by the levels of processing hypothesis, on the other hand, the levels of consciousness was not so much the issue as was whether subjects processed the form or the meaning of the information. In Zinchenko's studies subjects were always required to process the meaning of the information since they always made the arithmetic calculations. In a sense the two approaches examine orthogonal dimensions of processing.

A recent Soviet memory study that has more in common with the levels of processing hypothesis but is still motivated by the theory of activity was conducted by Tikhomirov and Klochko (in preparation). This study was aimed at investigating the important issue of goal formation in psychology. As Soviet authors such as A.N. Leont'ev (in preparation) and Tikhomirov (1977) have pointed out, most studies which investigate actions and their associated goals utilize experimental designs in which subjects are confronted with well-defined, ready-made goal. In this connection, Leont'ev has (in preparation) argued that:

... the range of objectively adequate goals depends on the motive of the activity. The subjective selection of the goal (i.e., the conscious perception of the most immediate result to be attained if the agent is to execute the activity that will satisfy the motive) in a special process which is almost completely uninvestigated. (in preparation, p. 27)

In the study carried out by Tikhomirov and Klochko (in preparation), subjects were asked to carry out various activities with each of several sets of materials (e.g., written passages, series of pictures depicting a sequence of events). In all cases, there was some contradiction or inconsistency in the material. For example, in one case, subjects read aloud a passage about a group of boys floating down a river in a boat, and the passage included several points at which the river was described as flowing uphill (e.g., "... during the rare, protracted, high ascents."). The first task posed to the subjects in connection with the passage was to examine it for grammaticality. After doing this, the passage was taken away, and the subjects were asked to recall it as completely as possible. Tikhomirov and Klochko found that most subjects (forty-four of forty-five) did not detect any of the contradictions in the passage in this condition. The subjects who did not detect the contradiction in this condition were then given the passage and asked to read it aloud once more, this time with the specific goal of remembering it. Again, practically none of the subjects (only two of the remaining forty-four) detected the contradictions. Those subjects who did not detect these contradictions in either of the first two conditions were then given the goal of reading the passage once again with the specific goal of finding contradictions. In this condition, most of the subjects (thirty-five of the remaining forty-two) detected the contradictions.

These data from Tikhomirov and Klochko's study are not particularly surprising. However, the authors also reported other data which indicate that those subjects who failed to identify any contradictions at the level of conscious judgment may have "detected" them at some other level. Tikhomirov

and Klochko utilized a method in which they made recordings of the subjects' galvanic skin responses while the subjects were reading the passages aloud in the various conditions. The authors discovered that the GSR recordings of some of the subjects fluctuated sharply when they were reading the contradictory sections of the passage. Furthermore, the authors reported that those subjects in whom these fluctuations occurred tended to avoid or distort the contradictory sections of the passage when retelling it, whereas those subjects who showed no GSR fluctuation did not have this pattern in their recall. Tikhomirov and Klochko also reported that if subjects showed no GSR fluctuation or recall distortion when carrying out the task of checking for grammaticality or reading for recall, they were unlikely to detect the contradiction, even when specifically instructed to do so. That is, the indicators of nonconscious detection of the contradictions were good predictors of detection at a conscious level when subjects were specifically directed to search for a contradiction. Tikhomirov and Klochko summarize their findings as follows:

It seems to us that these facts are extremely important for understanding the mental processes which occur in connection with the emergence of the object of thought for the subject. Thus, the fact that subjects "avoided" the contradiction digressed from it, or changed the content of the associated part into a noncontradictory form indicates that they reacted to the contradiction but did not consciously perceive it. At the same time, this unconscious level of the subject's reflection creates the prerequisites for successful realization during a search for the contradiction. This is supported by the fact that all the subjects who reacted to the contradiction at the unconscious level were later able to detect it when given the goal of searching for it. (In preparation, p. 17)

Thus, here again we see how the theory of activity influences the formulation of empirical research problems. As Tikhomirov and Klochko point out, "The data we have obtained in the process of our investigation show that the success of detecting a contradiction depends directly upon the structure of the activity the subject is carrying out." (p. 34) Furthermore, their experimental paradigm was motivated by the problem of goal formation which emerges within the theory of activity.

#### IV. Implications of the Soviet Theory of Activity for Cognitive Psychology in the West

Up to this point we have said relatively little about how the themes outlined in the theory of activity are related to research carried out in cognitive psychology in the west. In those cases where comparisons were made, we usually stressed the important ways in which the two approaches differ. In this final section of our review, we will make a more systematic comparison between Soviet and western psychology. We will see that there are many concerns that western cognitive psychologists share with their Soviet colleagues. In reviewing some of the ways that Soviet approaches have influenced western cognitive psychology, we will attempt to touch on two main issues. First, we will identify areas in western cognitive psychology which have emerged in connection with Soviet research findings and theoretical approaches. In some cases this will entail a discussion of problems in this research which seem to us to have arisen because western investigators have not appreciated all the theoretical issues inherent in the Soviet theoretical framework. Second, we will identify some areas of western research which have not taken a Soviet approach into account, but in our opinion could benefit from doing so.

Our discussion in this section will be in terms of the themes in the theory of activity outlined earlier. However, we should note that we are using these themes as guideposts with the understanding that they are not neatly isolable. In the final analysis they can be properly interpreted only when they are considered as parts of an integrated theoretical framework. Thus it will often be the case that two or more themes will implicitly or explicitly be involved in the discussion of a study or group of studies.

With regard to the first theme - that of genetic explanation - we would like to point out that for western psychologists the notion of development has usually been limited to ontogenesis. This fact is what prompted Cole and Scribner (1978) to point out that for Vygotsky, the notion of "developmental" should not be confused with the study of child development. As our earlier discussion of genetic explanation indicates, Cole and Scribner's point is applicable to most Soviet psychologists. Among them there is a general tendency to view all forms of development and change as potential arenas for examining human psychological phenomenon.

Because of their Marxist theoretical foundations, Soviets have been particularly concerned with historical processes (remember that the term "socio-historical" is often used in the USSR to refer to Vygotsky's approach). In the west, psychologists have generally given little attention to historical processes. There has been a tendency to make the implicit assumption that cognitive processes remain relatively constant across socio-historical settings. Recently, however, a few studies have begun to appear that take historical context into account. For example, Cole and Scribner and their colleagues (Cole, Gay, Glick and Sharp, 1971; Cole and Scribner, 1974, 1977; Scribner 1974) have argued that the development of cognitive skills can only be understood when we take into account the cultural and historical context within which they are found. These investigators have been particularly concerned with the way that educational institutions and activities affect cognitive processes. They have argued that the participation in the activities found in formal educational settings has a profound influence on cognitive functioning. In the case of memory, for

instance, Cole and Scribner have argued that:

Schools represent the major cultural institution in technological societies where remembering as a distinct activity, occurring apart from the application of anything remembered, is engaged in repeatedly with a great variety of stimulus materials. (1977, p.269)

They emphasize that individuals in cultures that do not have these educational activities should not be viewed as being cognitively deficient. Rather, the question is one of how various cultural and historical settings encourage alternate, but equally adaptive and intelligent ways of cognitive functioning.

In addition to these cross-cultural studies which examine the issues of how the cultural-historical setting influences cognition, authors such as Buck-Morss (1975) and Reese (1974) have examined these problems. However, such studies are rare. As Meacham has pointed out in a recent review:

These various studies certainly have not yet provided the data necessary for a comprehensive theory of the interaction of cultural-historical with individual development; more thorough analyses are needed to understand the ways that memory activities are shaped by the contexts within which they occur. (1977, p. 289)

Soviet psychological theory has had the greatest influence on cognitive psychology in the west in connection with the theme of mediation. We will analyze two areas in western psychology where this theme has had to influence studies of self-regulative speech and studies of strategic functioning.

There have been many recent studies of self-regulative speech in the west. A recent review of this research by Fuson (in press) includes over fifty western articles, dissertations and books in its bibliography. Most western studies on private speech have been based on the ideas and techniques outlined by Luria. Because of the differences we outlined earlier between Luria and Vygotsky's notions of self-regulative speech, we view this fact as being quite significant. Although most western authors who deal with the issue of "self-regulative,"

"private," or "egocentric" speech recognize Vygotsky's role in formulating the issues, very few recognize that by relying solely on Luria's studies they are basing their ideas on a particular version of regulative speech which does not emphasize the same phenomena and analyses as proposed by Vygotsky. Much of this problem is attributable to the fact that fewer of Vygotsky's writings have been translated into English than is the case for Luria. Whatever the reasons for using Luria's techniques and ideas, it is important to realize that by arguing for or against his position, one is not necessarily arguing one way or the other with regard to Vygotsky's position.

Although Luria's studies are often cited in connection with the issue of self-regulative speech, there has been a great deal of difficulty in replicating his findings in the west (e.g., Bronckart, 1973; Rondal, 1974; Wozniak, 1972). The study that is often cited as the sole western replication that clearly supports Luria's position was conducted by Joynt and Cambourne (1968). Almost all of the studies on this topic are concerned with the relationship between speaking and the initiation or inhibition of motor acts and thus derive from Luria's concern with neuropsychological issues.

Since several reviews and analyses of these studies are already available (e.g., Bloor, 1977; Fuson, in press; Wozniak, 1972), we will not go into detail about the interpretation of the findings and how they support or fail to support Luria's position. The major point that we will address concerns how these studies can be interpreted within the general theoretical framework of Soviet cognitive psychology. At least in some cases, western investigators' concern with the isolated issue of how private speech mediates cognitive processes has led them to

use experimental techniques and forms of argumentation which reflect a misunderstanding of the overall Soviet theoretical framework. For example, western research on this issue almost never considers how a particular behavior which is regulated by speech would fit into the structure of an activity. An exception to this is a study by Meacham (in press) that examines the use of speech to remember the goals of actions.

The major weakness of western research on the regulative function of speech is that it has failed to appreciate the fact that according to the Soviet approach the psychological processes at issue have their origins on the social, or interpsychological plane. That is, western investigators have failed to appreciate the importance of genetic explanation and as a result have not traced the regulative function of speech back to its social origins. It is not difficult to identify the reasons for this tendency. First, the early western research which was important in founding the "mediational approach" (e.g., Kendler, Kendler, and Wells, 1960; Reese, 1962) was primarily concerned with the capacity of speech produced by an individual subject to regulate his/her own behavior. This research therefore focused on individuals' performance once they had already begun to function on the intrapsychological plane. Second, as noted earlier, the Soviet writing that guided most of this research were those of Luria with their concomitant neuropsychological concerns.

Before going any further we should note that in many respects, our comments are not necessarily criticisms of the way that the mediational hypothesis has been developed in the west. This is so because much of the research spawned by this hypothesis was never intended to answer all the questions addressed within a Soviet approach. However, if one is seriously

concerned with a Soviet theoretical framework or if one is interested in identifying ways that the mediational hypothesis devised in the west can be expanded and enriched, various themes in the theory of activity such as genetic explanation and the social origins of cognitive abilities become important.

In the study of self-regulative speech these themes have usually been ignored. As a result, the crucial issue of how self-produced, self-regulative speech is connected with speech used in social interaction is usually overlooked. Rather than being concerned with how the regulative aspects of social interaction are internalized, the emphasis has been on how the linguistic code which has been extracted from its social context mediates motor behavior and cognitive processing.

Perhaps the best example of how western investigators have avoided dealing with the social origins of self-regulation can be found in studies in which the investigator removes young children from a social setting when studying their self-regulative speech. Investigators who conduct such studies often report that the incidence of private speech falls drastically in such settings in comparison to social settings. Several of Vygotsky's studies on private speech in Thought and Language dealt with this very issue. In those studies he demonstrated that in settings where social interaction was precluded, the incidence of private speech fell. The point of these demonstrations was that at a certain stage in the ontogenesis of private speech, the child has not yet differentiated the self-regulative function of speech from the social function from which the regulative function emerges. Thus, the general theoretical framework of Soviet psychology would suggest that rather than trying to ignore or "control" the social foundations of self-regulative speech, investigators should examine them and how they result

in various patterns of self-regulation.

Another line of research on self-regulative speech that is not so susceptible to this criticism has been developed by Meichenbaum and his colleagues (Meichenbaum, 1974, 1977; Meichenbaum and Goodman, 1969, 1971, in press). They have developed and tested techniques involving self-regulative speech which have clinical applications such as treating impulsiveness in hyperactive children. Rather than studying the processes involved in the normal transition from interpsychological to intrapsychological processing, this research utilizes training routines which are specifically aimed at developing or redeveloping self-regulative speech.

A second area of cognitive developmental research in the west that has been influenced by the Soviet theme of mediation is concerned with problems of "strategic behavior" and "metacognition." In a recent discussion of metacognition, Brown (1979) has distinguished between: a) metacognitive activities which are concerned with conscious reflections on one's own cognitive abilities, and b) metacognitive activities which are primarily concerned "...with self-regulatory mechanisms during an ongoing attempt to learn or solve problems." In her own writings Brown (1978; Brown and DeLoache, 1978) has identified metacognitive skills of the second type such as "checking," "planning," "monitoring," "testing," "revising," and "evaluating"

Soviet research has the most to offer in connection with this second category of metacognitive activities. The theme of mediation is particularly relevant in this regard given the fact that Soviet authors such as Vygotsky (1978, in preparation a, in preparation b, in preparation c), Levina (in preparation) and Istomina (1977) have stressed the importance of gaining conscious control over mediational means. For example, Isotomina has argued that the

poor memory performance she found in preschoolers was "...not due to the fact that their mnemonic capacities were, in general, still poorly developed but to the fact that they were as yet unable to memorize deliberately and voluntarily. "(1977, p. 110) Similar concerns have surfaced in much of the recent American research on memory strategies. This represents a movement away from explaining cognitive abilities such as memory in terms of information processing capacity. In its place, investigators such as Flavell and Brown are arguing that the ontogenesis of these abilities must be analyzed from the perspective of children's voluntary control over the mediational means to be used in a particular task setting. In a recent critique of previous research on memory development Brown and DeLoache make this point as follows:

The predominant explanation, when one was offered at all was that immature learners have a limited memory "capacity"; and as they mature this capacity increases, allowing them to retain more. The underlying metaphor, whether implicitly or explicitly stated, was the mind as a container: little people have little boxes or jars in their heads, and bigger people have bigger containers. (1978, p. 4)

In contrast to such capacity explanations, authors such as Brown and DeLoache have focused their research on the issues of when and why children apply these "capacities" appropriately and what can be done to foster development in this area. Similar issues arise in connection with the ideas developed by Reese (1962) and Flavell and his colleagues (Flavell, 1970, 1976; Flavell, Beach and Chinsky, 1966) concerning mediation deficiencies (instances in which verbal responses are produced or elicited in a subject but do not serve to mediate memory processing) and production deficiencies (verbal mediation would improve memory performance, but subjects fail to use it spontaneously).

Rather than outlining all the recent American studies on metacognitive and strategic skills and how they are similar to Soviet studies, we will focus on a few ways in which the two approaches differ. In particular, we will be concerned with some of the criticisms that the theory of activity would make of the recent western research. Here again these criticisms emerge because western investigators have isolated what Soviets consider to be one theme in a theoretical framework from the other themes with which it must ultimately be integrated.

Specifically, the issue again is one of failing to consider the social origins and development of mediational means. Soviets would criticize the research on strategic abilities on the basis of two criteria: the failure to use genetic explanation and the failure to recognize the social origins of cognitive abilities in ontogenesis. Almost all of the recent western research on strategic and metacognitive abilities has used experimental techniques which examine individuals' intrapsychological functioning in a task setting. Carrying out the tasks in a social setting (i.e., on the interpsychological plane) is specifically excluded in these studies, thus making it impossible to examine what Soviets consider to be the origins of these individual abilities. Soviets object to this exclusion for two reasons. First, it prevents the investigator from tracing the entire developmental sequence which is involved. Second, and more importantly, by failing to examine the social origins of cognitive abilities, they would argue that investigators are ignoring an extremely important explanatory foundation. They are failing to consider the possibility that individuals' cognitive abilities are social relations which have been internalized.

Very recently, several western investigators have begun to consider the issue of the social origins of cognitive abilities more seriously. It is

interesting to note that virtually all of this research has been conducted by investigators who are familiar with Soviet approaches to psychology. For example, Wertsch (1978, 1979, in press; Wertsch, Dowley, Budwig and McLane, in press) has begun to examine strategic functioning that occurs on the interpsychological plane by analyzing adult-child interaction in problem solving settings. In particular, he has been concerned with the communicative devices that allow preschoolers to become integrated into an adult-child problem solving system and then take over the strategies inherent in adults' communication. By making this transition it is argued that children can then begin to function on the intrapsychological plane. Brown and French (1979) have also argued for analyzing the relationship between interpsychological and intrapsychological functioning in a recent analysis of intelligence testing procedures. Beginning from Vygotsky's (1978) notion of the zone of proximal development they have argued that western testing methods need to rely more heavily on procedures that allow us to observe a child's performance in social interaction settings rather than focusing so completely on procedures which are aimed at minimizing or controlling the influence of such settings.

Another line of research motivated by similar theoretical concerns is being carried out in England by Wood and his colleagues (e.g., Middleton and Wood, 1979; Wood, 1969; Wood, Wood and Middleton, 1978; Wood, Bruner and Ross, 1976). Their position on the issue of how social interaction provides the basis for individual cognitive abilities is very close to Vygotsky's. This is apparent from Middleton and Woods's statement that:

We are presently pursuing the idea that effective, self directed thinking resides in a process of internal dialogue... And the form of dialogue which the thinker holds within himself is rooted in social interaction; in the comments, evaluation and strictures placed upon his overt action by others in his culture. (1979, p. 1)

Cole and his colleagues (Cole, Hood & McDermott, 1978) have recently

proposed an even "stronger" stand in connection with cognitive functioning in social settings. They go beyond emphasizing the role of social interaction in the development of individual cognitive skills and argue that more attention should be devoted to the study of how various cognitive tasks are normally carried out in social groups, even when the participants are mature cognitive agents. These authors have criticized much of contemporary western cognitive psychology for being overly concerned with the isolated, self-contained agent and ignoring the issue of how psychological processes are normally embedded in social settings. Their approach has much in common with the studies of Lomov (1978) and Kol'tsova (1978) outlined earlier.

The final instance to be considered here in which the Soviet theory of activity may have an important comment to make about western developmental cognitive psychology is connected with the issue of how a cognitive task may fit into a subject's activity. Recall that Leont'ev dealt with this issue in connection with his notion of sense or the relation between an activity (and its motive) and an action (with its goal). As outlined earlier, Istomina's (1977) study of the development of voluntary memory was also aimed at examining this issue. When she asked young preschoolers to recall a list of words in a standard experimental task setting, they performed quite poorly. According to Istomina this poor performance resulted from the fact that "... the task presented to the child, namely to memorize words, did not flow intrinsically from the nature of the situation itself, but was imposed externally, as it were, by the adults." (p. 113) When the children were asked to carry out an equivalent memory task in a setting that the children could understand and participate in (a play situation), their performance improved. Thus, by embedding a goal directed action in different activities, Istomina was able to illustrate an argument in the 1940's that had only

recently emerged or re-emerged in western cognitive psychology. This is the issue of how socially defined aspects of the experimental setting can influence subjects' performance on cognitive tasks.

Cole and his colleagues (Cole and Scribner, 1974, 1977; Cole, Gay, Glick, and Sharp, 1971; Cole and Bruner, 1971) have been urging their colleagues in the west to deal with this issue for several years. They became acutely aware of it while conducting their cross-cultural research. More recently, Donaldson (1978) has used similar criteria to criticize much of the research in cognitive development being carried out in the west. She has focused her criticism on many of the assumptions which underlie Piaget's theoretical approach and experimental techniques. For example, she outlined the results of an experiment by Hughes (1975) which was designed to duplicate the cognitive requirements of the "mountains task" used by Piaget and Inhelder (1956) but involved a doll hiding behind various walls from a policeman rather than a model of a landscape. Hughes changed the positions of the dolls representing the boy and the policeman vis-a-vis the young subjects such that various perspective-taking operations were formally identical with those used in the mountains task. Despite this formal identity, children's performance on this task was much different than that reported by Piaget and Inhelder. Hughes found that 90 per cent of the responses of 3½ - 5-year-olds were correct - an extremely high figure in comparison with the findings on the mountains task. On the basis of these findings, Donaldson argues that

The point is that the motives and intentions of the characters are entirely comprehensible, even to the child of three. The task requires the child to act in ways which are in line with certain very basic human purposes and interactions (escape and pursuit) - it makes human sense. Thus it is not at all hard to convey to the child what he is supposed to do: he apprehends it instantly. It turns out that neither is it hard for him to do it. In other words, in this context he shows not of the difficulty in 'decentering' which Piaget ascribes to him. (1978, p. 24)

This quotation from Donaldson reflects an opinion that seems to be gaining widespread acceptance among western developmental cognitive psychologists. It reflects the notion that rather than attempting to define cognitive tasks solely in terms of their logical or mathematical properties, we must be more concerned with how these tasks may or may not fit into the flow of the child's activity. For the most part, there has been little attempt among western psychologists to construct a comprehensive model that would deal in a positive way with such problems. Rather, the issue continues to surface in the form of critical comments about existing paradigms.

Soviet investigators have typically been critical of western studies along these very lines. Thus they often argue that western psychologists' unwillingness to view cognitive processes from the perspective of how they fit into the overall activity of their subjects has led to many findings that at best fail to add up to a general account of human cognition and at worst contradict one another. Rather than trying to control or exclude all the aspects of a subject's activity except the narrowly defined cognitive process at issue, Soviets argue that we must be aware of them and include them in our theoretical accounts.

While the Soviet theory of activity does not provide all the answers to these important problems, it does have several specific suggestions. Without reviewing all the points and themes raised in this paper, we would like to identify a few of these. First, in accordance with Leont'ev's notion of the levels of abstraction or analysis in the theory of activity, we should be aware of the many things that a subject is doing in an experimental setting. Thus, s/he may have the conscious goal of responding appropriately to a series of questions, but the subject may perceive the experimental activity as play, serious scientific inquiry or any number of other activities, depending on his/her age, cultural background, etc. As Istomina's

study suggests, subjects' understanding and execution of what the experimenter perceives as one and the same task may vary depending on the activity in which it is embedded.

Second, from the studies of P.I. Zinchenko (in preparation) and Tikhomirov and Klochko (in preparation) we have seen that the "same" cognitive task may be carried out at different levels (as an action or as an operation) identified in the theory of activity and that this fact can have an important influence on subjects' performance. Zinchenko's findings are particularly interesting to the developmental psychologists since he has demonstrated that the level at which a task will be carried out varies at different ontogenetic stages.

Third, El'konin's notion that different phases of ontogenesis are associated with various dominant activities is worthy of further investigation. Although the idea in its present form is rather vague, its importance may be seen when we consider that authors with vastly different theoretical orientations have consistently found that children for whom El'konin would say the dominant activity is play can carry out cognitive tasks in a play setting that would otherwise be quite difficult or impossible for them.

Any attempt to take into account all of these and other points in the theory of activity obviously extends and complicates western psychologists' tasks and goals. However, Soviet investigators would argue that if western psychologists continue to ignore the overall nature of activity when studying a cognitive process, they will be doomed to collecting misleading and incompatible bits of empirical data that can never be integrated into a comprehensive theoretical account of human cognition.

### Footnotes

1. An important terminological problem arises at this point. The term "methodology" (metodologiya) has a specific meaning in Soviet psychology and must be distinguished from the study of problems of "method" (metodika). As Brozek (1974) has pointed out, Soviet authors such as Rubinshtein have used the term "metodika" to refer to the specific practices used to investigate a problem in psychology (what western psychologists would normally refer to as "methodology," "experimental design," "statistical methods"). In contrast, Soviet authors use the term "metodologiya" to refer to an epistemological approach to psychological phenomena. Thus, the term that is translated as "methodology" has a different meaning for Soviet cognitive psychologists than it does for their western colleagues. It is concerned with issues that we would normally consider when speaking of a general theoretical framework.

2. Although we will see that Piaget's approach to the study of human cognition differs from that used by the Soviets in important ways, there is a great deal of agreement between the two parties on the issue of genetic explanation. Thus, in an overview of his theory Piaget has stated that:

... in order to resolve the problem of what is knowledge (or its diversity of forms) it is necessary to formulate it in the following terms: how does knowledge grow? - by what process does one pass from knowledge judged to be ultimately insufficient to knowledge judged to be better (considered from the point of view of science)? (1970, p. 729)

3. An important exception to this general statement can be found in the research conducted in Geneva by Doise and his colleagues (e.g., Doise, Mugny and Perret-Clermont, 1975). This research has indicated that certain aspects of young children's operative intelligence (e.g., as manifested by performance on Piaget and Inhelder's (1956) 'mountains' task which requires perspective-taking skills) can improve as a result of carrying out a task in collaboration with older children who have already mastered it.

4. As Bruner (1962) has pointed out, Vygotsky has much in common with members of the Pragmatist school of philosophy and psychology in the U.S. such as George Herbert Mead. The similarity is indeed striking when it comes to this point about the social origins of the individual. (e.g., Mead, 1924-25, 1934; Cooley 1922.)

5. It is important to note that Vygotsky was specifically interested in speech and not language. This distinction needs to be emphasized because there is room for confusion on this issue due to certain translation practices that are sometimes used. Specifically, there is a clearcut distinction between speech (rech') and language (yazyk) in Russian, but the last word in Vygotsky's important volume Myshlenie i Rech' has been translated as language. Thus a more appropriate title would have been Thought and Speech. Perhaps because of such translation processes, there has been a tendency in the west to understand Vygotsky as being primarily interested in language as it is often studied by linguists - as an abstract code which can be analyzed independently of its role in communicative interaction. This was clearly not his intention. In fact, as A.A. Leont'ev (1969) has pointed out, Vygotsky's notion of speech was also somewhat more inclusive than we normally consider in the west.

... it would be totally incorrect to reduce communication to the transfer of a coded message from one individual to another. We would be likely to renounce such a simple approach if we subscribe to a notion of communication which corresponds more closely with our current level of knowledge about the nature and concrete facts of the speech process. Such an idea is the activity-oriented conception of speech. This conception treats speech as a particular kind of activity (deyatel-nost') namely as speech activity. (rechavaya deyatel-nost'). This treatment was first proposed in Soviet (and worldwide) science by Lev Semonovich Vygotsky. (1969, p. 25)

Thus, whenever Vygotsky and his followers have dealt with how language plays a role in mediating psychological processes, they have been concerned with the communicative or speech activity in which language is embedded rather than with language as an abstract, formal system as such. Of course this is

entirely consistent with the general activity-oriented approach used in Soviet psychology. It gives speech activity a somewhat "priveledged role" because other forms of activity are viewed as mediated by the psychological processes developed within this realm.

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